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# AMERICAN JOURNAL OF OPHTHALMOLOGY

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BEING THE

## Ophthalmic Year Book Volume XIV

Containing a Digest of the Literature of Ophthalmology  
For the Year 1917 and Parts of 1918.

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# EXPLANATION

This supplement to the AMERICAN JOURNAL OF OPHTHALMOLOGY is paged to be bound separately, so as to constitute a volume in continuation of the series of the Ophthalmic Year-book. It consists essentially of the Table of Contents which precedes, the Digest of the Literature that immediately follows, the Bibliography coming after that, and the Subject Index completing the volume.

The Table of Contents shows the grouping of subjects in the "Digest." Not all subjects appear in this table; but enough are given to enable anyone familiar with ophthalmology to judge where in the volume a particular topic would be found, if it has been discussed in the literature of the period covered. The period covered is generally a year or more. In this particular volume it takes up the literature, succeeding that noticed in volume 13 of the Ophthalmic Year Book, and reviews it up to the time each particular section of the digest was written.

At the head of each section is mentioned the period it covers. In this particular volume these periods vary from 11 to 22 months. This is because of the transition from an annual volume to the publication of some part each month. Hereafter each section will represent the literature of the year elapsed since the last review on the subject was written.

The Digest of the Literature gives the essential discoveries or new ideas published; as those (p. 8), with regard to the sterilization of corneal ulcers, or the effects on the lens of radium exposures in the treatment of retinal gli-

oma. Important studies like those on the development of the anterior chamber or the secretion of the aqueous, receive extended notice.

Clinical observations regarding important facts make up a large part of the Digest; and papers that include nothing new, but may be worth consulting by some one engaged in the study of a particular subject, also are mentioned, with some indication of what they contain. Some papers which contain only what is already current in ophthalmic treatises and journals, and are intended for the instruction of those who are not ophthalmologists, are not mentioned.

The paragraph headings indicate the general subjects dealt with, or the particular one of several subjects that make the paper valuable. Other subjects mentioned incidentally are often indicated in italics. The names of authors of papers are printed in **heavy face** type, to make them quickly discoverable when the statements made by a particular author are the matter of interest. To discover where the paper referred to has been printed, turn to the author's name in the bibliography.

The Bibliography includes the titles of all papers alluded to in the "Digest," and a few others not so used; with the journal, volume, and page on which they are to be found. The title is always given in English, and often is abbreviated, or altered so as to indicate more clearly what the paper is about. -

The arrangement is by the authors' names, placed alphabetically; the titles of all papers an author has published

being grouped under his name. Papers of joint authorship are placed below the name of the author first mentioned in the publication; and are cross-referenced under the name of the other author or authors. A special explanation of the method of using the bibliography will be found preceding the first name on page 255. The last figures (**heavy face**), given after each title, indicate the page in the digest on which the paper is referred to.

The Subject Index follows the bibliography. It is the ordinary alphabetic index of the book. It supplements the general arrangements of the

"Digest" as shown in the table of contents. It must be remembered in using it that a subject may be indexed by the use of any one of several leading words. "Acuteness of Vision" may be indexed under A; or under V as "Visual Acuity," or "Vision." If reference to the desired topic is not found under the word first thought of, look for it under some other word that might have been used instead. If not found in this way, one may fall back on the table of contents, and examine the sections of the digest in which it would naturally be considered.—E. J.



# DIGEST OF THE LITERATURE.

## METHODS OF DIAGNOSIS.

EDWARD JACKSON, M. D.

DENVER.

This section reviews the literature of 1917, on ophthalmic diagnosis in general. Papers referring to the diagnosis of any particular disease will be found mentioned under the heading of that disease or the class to which it belongs.

**OPHTHALMOSCOPY.**—**Lucanus** to examine the anterior media illuminates the eye with the ophthalmoscope from a distance of one-half meter, and views it through a convex 6 D. lens held nearly its focal distance from the cornea. This magnifies the cornea about two diameters and shows minute foreign bodies, epithelial lesions, and minute opacities that are invisible by ordinary oblique illumination.

**Feilchenfeld**, to secure a dark-room in a large light ward, has used an umbrella with a black curtain attached to its margin much as suggested by **Lundsgaard** (*O. Y. B.*, v. 11, p. 18). Beneath this the patient and surgeon can escape the general illumination around them.

**Blanco** adopts the view that the unfavorable results on vision following the use of arsenical preparations, especially salvarsan and neosalvarsan, are due to the exaggeration of previously existing ocular diseases. He therefore urges that prior to their administration a careful ophthalmoscopic examination should be made; and believes that when the eyes are strictly normal the therapeutic use of such drugs is not dangerous.

**Best**, in 328 cases of serious war injuries to the head, found choking of the disc in 40 per cent. But in the first year of the war they amounted to 45 per cent., and in the second year to only 25 per cent., the improvement being ascribed to early and frequent intervention. The choking was more marked on the side of the injury in 61 out of 70 cases. In one case the swell-

ing appeared as late as the fifty-second day. In a war atlas of ophthalmoscopy **v. Szily** has published plates of various injuries in the ocular fundus.

The post-mortem segmentation of the blood column in the retinal veins due to coagulation has been described

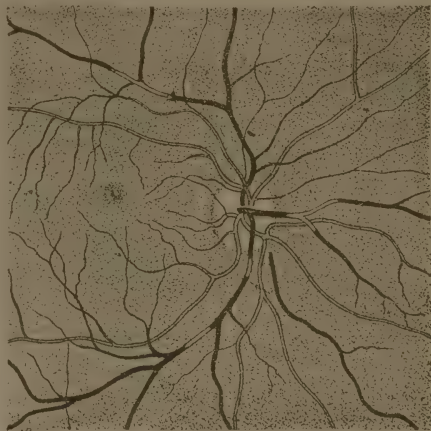


Fig. 1.—Interruption of blood column in retinal veins an early sign of death. (Kahn.)

by **Kahn**, who records his observation in three cases. The interruption of the venous blood column gave the appearance indicated in the accompanying illustration.

Such interruptions were found in the larger veins, in one case as early as forty-five minutes after death. The examination may be facilitated by dilatation with a mydriatic, which is possible several hours after death. Clouding of the cornea may be prevented or removed by instillation of distilled water. Among the many ocu-

lar signs of death that have been described (see p. 6) this is perhaps one of the most reliable and important.

**DIAPHANOSCOPY (TRANSILLUMINATION).**—The only allusion to the method of making this examination in the literature of the year, is that of **May**, who endorses the suggestion of **Young** (*O. Y. B.*, v. 13, p. 19), for using the lamp and illuminating rod of the **May** ophthalmoscope. A half-inch of rubber tubing slipped over the lamp with its end applied to the cutaneous surface of the lids will give the necessary illumination.

**OBLIQUE ILLUMINATION.**—**Koeppé** has used the **Nernst** lamp and the **Gullstrand** arrangement of lenses as a corneal microscope. By such microscope during life he is able to positively recognize, at a very early stage, the tissue changes of the palpebral conjunctiva and limbus in vernal conjunctivitis. These changes indicate the importance of the vascular proliferation.

He has studied defects in the endothelium of **Descemet's** membrane, and the changes in the deepest layers of the cornea produced by the penetration of the aqueous. Some of the changes constitute an internal bullous keratitis developing from epithelial phlyctenules. Congenital swellings at the posterior surface of the cornea were also noted. In all forms of iritis he found deposits upon the posterior corneal surface. These take the form of droplets, fibres, stars, or conglomerates. The **Nernst** lamp enables such deposits to be recognized at a stage when they would be invisible with the ordinary corneal microscope. Such deposits are found less frequently on the anterior capsule of the lens. They are of no importance in determining the etiology.

**TONOMETRY.**—A new form of tonometer devised by **Albarenque** has a foot-plate, 8 mm. in diameter, attached to a rod which pushes against a spring. The rod is graduated both ways from a point designated by **N**. This point is reached by a pressure equivalent to 20 mm. of mercury, which **Albarenque** takes to be the normal intraocular

pressure. From this point the graduation extends both ways. The advantages claimed are that the instrument can be used with the patient either sitting or standing erect and the eyes directed horizontally. The test should be repeated several times and the average taken as the definite tension of the eye.

**Cridland** has tested 1,001 normal eyes with the **Schiötz** tonometer, the patients varying in age from 7 to 88 years. The results he has tabulated by decades, and also according to sex. He gives them in supposed equivalent millimeters of mercury.

He found the tension highest in the first decade, 23.75 for 12 patients. In the second decade it is 20.69; in the third decade 19.30; in the fourth 19.13; in the fifth it rose to 19.26, and in the sixth to 21.47; but in the seventh decade and later fell again to 19.58. In each decade it was higher for females than for males, the difference being 5 mm. in the first decade and 0.15 mm. in the last.

He also reviews 70 consecutive cases in which the tonometer was used because of clinical indications. Of these 42 were undoubtedly cases of glaucoma. In none of them was the reading below 27 mm., but in 28 cases no glaucoma had developed up to the time of the reading of his paper. All these patients were over 40 years of age. Ten of them gave readings varying from 25 to 32.5. Five were cases of arteriosclerosis, with high blood pressure. Three of them were watched over periods of 6 to 11 years without showing symptoms of glaucoma.

**Cridland** sets the limits of normal readings as 11.9 to 28.55, and the average normal reading at 19.58. A difference between the readings of the two eyes of the same patient was noted in 21.2 per cent. of the cases. This difference varied from 0.5 to 7.5, and averaged 2.43 mm.

**Cridland** thinks that for one who works with the tonometer regularly the value of the instrument is not lessened by keeping records in supposed equivalent millimeters of mercury.



**Jackson** points out that lack of correspondence between the foot-plate of the instrument and the corneal curvature is liable to affect the reading. In 2,000 eyes he found the corneal curvature to vary from a radius of 6.5 to 11 mm.; although in almost 99 per cent. of the cases the curvature was from 7 to 8.5 mm. radius. In the extreme case of an 11 mm. radius of curvature the error due to this cause was the supposed equivalent of 8 or 10 mm. of mercury. He cites one case in which the cornea had a curvature radius of 7.1 mm. and the tonometer reading was supposed to indicate a pressure of 32 mm. Upon this a diagnosis of glaucoma had been made by another oculist and treatment instituted. But further observation of the case seemed to show that no glaucoma had been present. He found that stiffening of the coats of the eye by exposure to formaldehyde solution affected the tonometer reading so as to indicate a higher intraocular pressure. But the most important limitations on the practical use of the tonometer arises from high readings that would indicate glaucoma when other uveal inflammations are present.

**RADIOGRAPHY.**—In discussing radiography of the eye and orbit **Dixon** says it makes little difference what particular method of localization is used if the operator is familiar with it and "pays the strictest attention to the smallest details." The general radiographer is most likely to fail through not securing perfect fixation of the eye so that a foreign body fails to leave an appreciable shadow. He mentions one case in which eight radiograms failed to show any foreign body. The ninth taken by another operator showed it. It would have been shown on the first if the same care had been taken. It is better always to take two plates, since a defect on one plate, or a peculiar lining up of the septa of the nasal accessory sinuses, may imitate the shadow of a foreign body. He has not been able to determine the presence of tumors within the eyeball; but tumors in the orbit, as well as thickening or absorption of the orbital wall can thus

be recognized. Fractures involving the wall of the orbit will generally escape detection, unless so obvious as to be evident by other methods.

The localizing charts in use by radiographers, especially those used at the Royal London Ophthalmic Hospital, are criticized by **Fisher**. He finds they are based on Sappey's measurements of the female eye. The male eye is about one millimeter longer in its diameter, and the greater bulk of industrial accidents requiring radiography occur in males. This introduces an error with regard to the critical point as to whether a foreign body is within or outside of the eyeball. A point which **Fisher** does not discuss, but which is of equal practical importance, is that the localizing diagrams must be proportioned to allow for the divergence of the Roentgen rays; and the relative distance of the tube from the eye and plate must be properly observed.

**Fisher** does point out the importance of remembering that localization has to do with three coordinates. A point determined on the diagram may appear well inside of the eyeball, but if far enough forward or far enough back it may really lie entirely outside the globe. Thus a foreign body might be supposed to lie in the ciliary processes, where it would be most dangerous, when in reality it was embedded in the sclera and practically harmless.

**Villasevaglios** has written a monograph on Roentgen ray diagnosis of ocular diseases. His subject includes the diagnosis of intracranial processes, especially those in the region of the chiasm, lesions of the orbital walls, and anomalies in the shape of the orbit, diseases of the neighboring sinuses, and foreign bodies in the eyeball.

**KERATOMETRY.**—**Mitchell**, in studying the reflections from the corneal surface, found great difficulty in securing steady fixation of the patient's eye. This he has overcome by placing a piece of white paper, 2 cm. square, on the tube of the instrument for the patient to look at.

**VISUAL ACUITY.**—It is pointed out by **Luckiesh** that visual acuity is greater



by monochromatic light than by light representing a larger part of the spectrum. This is generally supposed to be due to the absence of chromatic aberration with the former. He reports the results of comparisons made with the Ives-Cobb instrument for testing visual acuity (O. Y. B., v. 10, p. 383). These results are as follows:

ACUITY AND BRIGHTNESS WITH DIFFERENT LIGHT SOURCES.

Source.	Acuity (Snellen Scale).	Equivalent Brightness of test-ob- ject (MgO Surface Il- lumination in meter- candles).
Green mercury line...	1.28	10
Tungsten lamp .....	1.14	10
Artificial daylight....	1.11	10
Tungsten lamp .....	1.28	28

The acuity is much greater for the monochromatic green light than for either tungsten light or daylight of the same brightness.

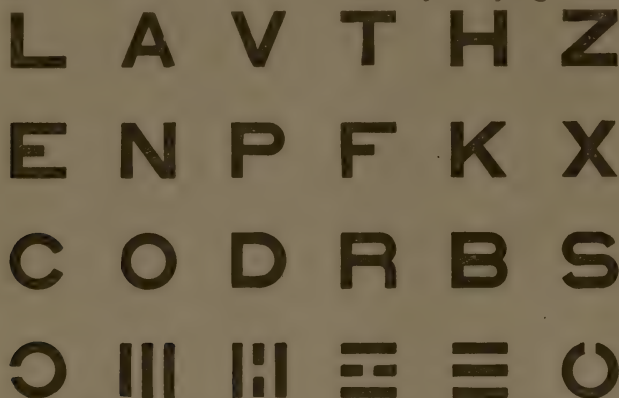


Fig. 2.—Gothic letters, Broken Rings and Ewing test for use at five meters. (Sec. on Ophthalmology A. M. A., 1917.)

Dunlap finds that visual discrimination is better measured by using a rectangular aperture of sensible width than with a line or slit. With such a test he found that light adapted eyes gave threshold values 30 per cent lower than eyes that were dark adapted.

The Committee of the Section on Ophthalmology of the American Medical Association (1917, p. 346) on Standardizing Test Cards, reported on comparisons of Gothic letters. The letters chosen are shown in Fig. 2, along

with the International test and the Ewing test. As compared with the International test, their results show that the visual acuity required to recognize each of the letters of standard 5' size was as follows:

L	0.62	F	0.81
A	0.71	C	0.85
T	0.72	K	0.88
V	0.74	O	0.88
H	0.74	D	0.88
Z	0.76	X	0.91
E	0.77	R	0.93
N	0.79	S	1.05
P	0.79	B	1.15

The Ewing test is slightly more difficult to recognize than the International Broken Ring, or any of the letters except B, being 1.13.

The value of symmetric groups on the International Broken-Ring test for testing visual acuity is urged by Jackson. With four cards indicating vision of 0.1, 0.5, 1 and 2 at five meters, all variations of visual acuity can be measured by varying the distance of the

card from the eye. Each half meter represents a change of one-tenth in the vision indicated; so that with one card each 0.01 of vision can be ascertained from 0.01 to 0.1. With a second card .05 intervals are obtained from .05 to 0.5. With a third card 0.1 intervals are obtained from 0.1 to 1. With a fourth card 0.2 intervals from 0.2 to 2. Lobanoff has discussed the problem of lack of correspondence between visual acuity and the objective changes in the eye. For the practical testing of visual

acuity of each eye separately **Thomas** has resorted to a reversible cardboard shade, which is easily kept in place, permitting the use of either eye alone as desired.

**PERIMETRY.**—A new hand perimeter has been devised by **Price**. The patient fixes the reflection of his own eye in a mirror. The test object is a cube, which passes along an arc having a radius of 13 inches. Dials indicate the position of the test object on its own arc and the meridian to which the arc corresponds. The sides of the test object are each 1 cm. square, and of the different colors used. **Price** claims that the instrument is accurate, speedy, comfortable for both patient and oculist, may be used anywhere, is comparatively cheap, and takes but little room.

The **Haitz** chart for stereoscopic mapping of the visual field (*O. Y. B.*, v. 4, p. 21) has been modified by **Lloyd**, who has extended it laterally to include the field up to 25 degrees from the fixation point. This is sufficient for the mapping of the blind spot. He has also had it made of slate, so that the boundaries of the field can be marked on it in chalk. Extension of the field renders necessary a special form of stereoscope, which has been made by the **Bausch & Lomb Company**.

The **Haitz** binocular localization of scotomata by means of the stereoscope has proven of such inestimable value to **Wells** that he has published a translation of the instructions that accompanied these charts believing that few have been able to get their exact significance from the original.

**Walker** has devised a perimetric apparatus, which can be suspended from above for taking accurately the field of vision of patients lying in bed. With this he has combined a series of lamps arranged in an incomplete circle, and chosen so as to furnish an artificial daylight. For this apparatus he claims the greatest possible range of service. The artificial illumination has proven a perfectly satisfactory substitute for daylight, superior to daylight in uniformity, constancy, availability, and control.

**Peter** has compared the campimeter

with the arc perimeter as to accuracy, practicability, and simplicity of technic, and finds the former so much superior that he regards the arc perimeter in its present form an obsolete instrument.

The significance of the so-called spiral fields of vision has been discussed by **Beaumont**, who regards them as evidence of rapid fatigue, and on that account as belonging particularly to neurasthenia. On the other hand, **Hurst** believes that when such a field is found it is an evidence of susceptibility of the patient to suggestion; and that the suggestion had been made in the method of taking the field of vision, or otherwise. Hence, they would be an evidence rather of hysteria than of neurasthenia. But in any case they depend more upon how the field is taken, and upon who takes it, than upon the condition present. Such fields cannot settle the diagnosis between malingering and hysteria.

The diagnostic and prognostic importance of the visual fields in ocular affections is the subject of a paper by **Sanchez Aguilera**.

**PHOTOMETRY.**—This subject is being scientifically studied chiefly in connection with artificial lighting by electricity. The papers bearing upon it appear in journals or society transactions devoted to physics and electrical engineering. Abstracts of several of them sufficiently complete for all purposes of the ophthalmologist appear in the *Abstract Bulletin of the Nela Research Laboratory*.

The visibility of radiation in the red end of the visible spectrum has been restudied by **Hyde** and **Forsythe**, who give a table showing the mean visibility of such radiations in nine subjects, and comparing these with other published results. In the main, they all agree fairly well, but the present table instead of stopping at 0.700, is carried to wave lengths of 0.770, where the visibility is only 1/10,000 as great as for 0.640. Differences between individuals are found here as they are in all other parts of the spectrum.

**Hyde**, **Cady** and **Forsythe** report investigations on the transmission of red pyrometer glass, both as to the



effective wave-length of monochromatic transmission, and changes due to variations in temperature, the limiting value of effective wave-length at different temperatures, or a temperature coefficient of transmission.

The effects of diffraction on the brightness measurements made with the optical pyrometer has been investigated by **Worthing** and **Forsythe**, who as a result lay down a series of some twelve necessary or desirable working conditions for such tests. The effects of diffraction, they believe, explain apparent discrepancies in such measures. Therefore, the source to be studied should be used as a background rather than a pyrometer filament, and the same filament should be used through the whole series of comparisons. The angle of the pencil used must be properly adapted by a diaphragm.

**Ives** and **Luckiesh** have made a special study of the influence of temperature on the phosphorescence of the alkaline earth sulphides. The varying rates of the growth and decay of the different color sensations have been suggested as causing discrepancies between the results of flicker photometry and direct comparison. **Luckiesh** has studied this subject and comes to the conclusion that the evidence is in favor of the flicker photometry.

A method of testing incandescent filaments for "spots"—portions where the filament is brighter or darker than the general average, has been described by **Lorenz**. The "overshooting," or excessive brightness of tungsten lamps when first lighted is believed by **Worthing** to be a physical fact and not merely physiologic. It occurs when the tungsten filament is in vacuum, and also when surrounded by gas; in the latter case amounting to about 6 per cent of the candle power. A plan of rating lamps as to filament brightness for use of fluctuating voltages has been devised by **Worthing**. An investigation of the diffusing effects of glassware used in lighting is recorded by **Luckiesh**.

**TESTS FOR SIMULATION.**—In connection with military service these tests have at present a greatly increased in-

terest and importance. The unmasking of simulation is largely a contest of wits. **Majewski** speaks favorably of a psychologic test, applied by the Snel-len illiterate card or the broken ring. When the subject persistently indicates the wrong direction through a series of twenty or more answers he is certainly malingering. If unable to see he should be right one time in four by mere chance. **Lischkoff** points out that the malingerer should never know he is under suspicion. Repeated examinations may be necessary. A general review of the more valuable of such tests has been published by **Keiper**. **Bernheim** has written on simulated and psychic blindness and autosuggestion.

**OCULAR REACTIONS IN DEATH.**—The signs of ocular reactions of death is the subject of a paper by **Terson**, who reviews the literature. He finds the conditions of the lids and palpebral aperture too variable to be of much value. The softening of the eyeball comes on only after some hours. The changes in the cornea may appear before death, and depend rather on exposure. Ophthalmoscopy cannot be usually serviceable. (See p. 1.)

The variability of the pupil and its behavior under mydriatics and miotics, makes it a very uncertain sign, even its reaction to an electric stimulus. Too much importance should not be attached to the effects of injections of fluorescein. The reaction of the tissues to dionin and other irritants is more reliable, and is found to cease within two hours after death.

**GENERAL DIAGNOSIS.**—The work of **Foster** on *Diagnosis from Ocular Symptoms* is original rather in its methods of considering and grouping the facts, than for any new diagnostic methods or special significance attached to particular symptoms. **Bal-lantyne** has written on eye symptoms and their interpretation. **Burke** considers the ophthalmoscopic findings in head injuries, and **Trainor** the fundus examination in vascular and brain disease. **MacKenzie**, **Osborne**, and **Harkness** have discussed the general diagnosis of ocular disease, and the ocular symptoms in constitutional disorders.



## THERAPEUTICS.

WILLIAM H. CRISP, M. D.

DENVER, COLO.

This section reviews the literature referring to general therapeutics appearing during 1917 to November 30th. The literature of particular diseases either constitutional or local will be noticed in the sections referring to those diseases.

**VACCINE AND SERUM THERAPY.** Writing with regard to the treatment of tuberculous eyes by local applications of tuberculin, **Ellis and Gay** state that it is now their routine practice to test every superficial recurrent inflammatory condition of the eyes and lids for tuberculosis; and that they are arriving at the conclusion that nearly all superficial nebulas and maculas are of tuberculous origin. All the cases so far treated have proved curable in from six weeks to three months; and so far only one relapse has occurred where the treatment has been completed, in spite of the fact that many of the cases have been continuously bad for years. In some of the worst cases the complete freedom from attack has existed for over eighteen months. The cases treated were mostly in children.

The treatment consists in instilling tuberculin into the conjunctival sac in various dilutions of increasing strength. No atropin or other local drug is used, except where the reaction from the tuberculin is excessive. In every case a preliminary cutaneous test is done on the forearm with tuberculin, using various strengths from undiluted bovine tuberculin to one in ten thousand human tuberculin. This is done not only for diagnosis, but to record susceptibility to tuberculin, the patients being classified into the following definite classes: hypersensitive, sensitive, subsensitive and insensitive. Various dilutions are used, each being ten times as weak as the next. The treatment is frequently repeated three times a week instead of twice. When the removal of opacities is undertaken the treatment is best commenced while the eye is quiescent, the dose being rapidly increased until a reaction is obtained, as it is found that some part of the opacity is generally removed at

each subsidence of the congestive symptoms.

**Phillips** emphasises the fact that the general tendency is to use the various tuberculins in excessive doses. If a reaction occurs, especially a focal reaction, tuberculin should not be given again until absolutely all signs of the reaction have disappeared.

Quoting the announcement by the Rockefeller Institute, that the pneumococcus is no longer to be regarded as a single organism but as a family of cocci composed of four different species, **Lehrfeld** states that the use of mixed pneumococcic serums at the Wills Eye Hospital has been very encouraging. While waiting for the laboratory to study the types found in the eye he proceeds to use the mixed serums. Local instillation in the culs-de-sac of the infected eye can only be relied upon in the superficial infections of the globe. In fulminating inflammations of the eye where the deeper structures are involved, it is advisable to use the serum intravenously as in the case of lobar pneumonia.

**Mueller and Thanner**, and in English **Dimitry**, describe the use of parenteral injection of albumin in the form of sterilized milk in the treatment of various eye conditions. The injections were always made into the gluteal muscles, using at each injection five c.c. of perfectly fresh milk, boiled for four or five minutes. A number of cases of iritis treated with injections of milk showed a rapid diminution of hyperesthesia and photophobia, and a shortening of the course of the disease. Usually three injections were given in a week, the treatment being renewed if necessary after a pause.

**RADIOTHERAPY.** Before the 1916 Heidelberg Congress (the proceedings of which are well reported in the

French *Annales d'Oculistique*), **Axenfeld** recalls the observation of a case of double glioma published by Kupferle, Wiedersheim, and himself in 1915. The retrogression of pain under radiotherapy continued. In the autumn of 1915, a cataract developed, which was operated upon in the summer of 1916. In this child of three years vision did not return until six months after the operation, a condition analogous to the amaurosis produced by blepharospasm having developed. The developing crystalline lens was damaged by the strong doses of the X-ray. This, however, is not a contraindication to such treatment. Radiotherapy should only be preferred to enucleation for the second eye, and when the vision is not too greatly diminished. The paper by **Cupperus**, noticed in volume 11, O. Y. B., p. 31, on the mesothorium treatment of eye diseases, now appears in English.

**LIGHT THERAPY.** **George and Toren**, who have for some years employed the leucodescent or therapeutic lamp in treatment of corneal ulcers, iritis, and episcleritis, describe a special therapeutic lamp for ocular use, in which the bulb is made of violet glass with a view to excluding the heat-producing rays of light, which soon become intolerable to the eye. It is necessary that the lamp shall be standardized as to focal distance, character of light, and the amount of heat produced. The lamp consists of an aluminum parabolic reflector containing a fifty-watt electric light with a violet glass globe, mounted on an adjustable stand with an adjustable face rest. With the lamp used by the authors, the patient must be so placed that the cornea will be at a distance of sixty mm. from the front of the bulb. Corneal ulcers, including those with hypopyon, iritis, episcleritis, and orbital abscesses are mentioned as having been treated successfully with the lamp.

**HEAT THERAPY.** For the treatment of hemorrhagic exudates and of transudates in the region of the anterior chamber, and also of affections of the anterior region of the eyeball, **Schieck** describes a method of diathermy which is said to have been used successfully

in the hospital at Siemensstadt. One electrode is attached to the arm, the other is fastened to a glass receptacle filled with a physiologic solution of common salt and applied in the fashion of an eye bath around the eye; upon opening the lids the cornea is bathed in the liquid. Even with a current of one ampère, an intense heat is communicated to the eyeball at the end of a few minutes.

From a series of experiments on rabbits' eyes, **Shahan** concluded that a temperature of 152 degrees F. applied for one minute was sufficient to stop an ulcerative process. From further experiments to determine how much damage this amount of heat did when applied to a normal eye, it was found in general that there was complete destruction of the epithelium over an area somewhat larger than the point used. The surface of the cornea became cloudy. But the epithelium replaced itself in four or five days, and the clouding slowly diminished. A description is given of a number of human cases in which the method was used for the treatment of pneumococcus infection of the cornea; the results indicating that heat when properly used is an effective therapeutic agent in such conditions.

In place of the somewhat complicated thermophor previously demonstrated by the author, he now describes a much simpler apparatus which may be used for one minute applications. A heavy piece of brass or copper tubing four inches long and nine-sixteenths inches in outside diameter, spoken of as the core, has at one end a lock-nut for holding fast the thermometer, while the other end receives the applicators. The applicator, shaped like a bullet, is hollowed out at the cylindrical end, to receive the bulb of the thermometer. A metal case, one and a quarter inches in diameter and a little over four inches long and heavily lined with felt, is just large enough in its inside measurements to receive the core. This acts as an insulating jacket for retaining the heat.

To use the instrument a properly shaped applicator is selected and



slipped into the end of the core. The thermometer is then fastened in place by a few turns of the lock-nut. Using the thermometer as a stem, the core is held over a flame until the mercury in the thermometer reaches about 170 degrees F. The core is then slipped into the insulating jacket, and the mercury in the thermometer observed until it falls to 156 degrees F. At this instant the tip of the applicator is placed in contact with the ulcer and held there for one minute, during which time the mercury will fall from five to ten degrees F. Care must be taken to see that the thermometer is in order, and directions are given for this purpose. In some later work the author states that it was found better to start with a temperature of 158 degrees F. instead of 156 degrees, as being more certain to stop the process in one application of one minute's duration.

For the removal of malignant and benign growths in the skin of the lids or of the face about the eyes, or in the conjunctiva, cornea or sclera, **Kearney** favors desiccation because the result is produced without the formation of a contracted scar. He uses for the process a high-frequency current produced through a high-speed static apparatus of sufficient power to dehydrate the cells, but not to carbonize them.

**ELECTROTHERAPY.** **Simon de Guilleuma**, impressed by the difficulties surrounding the ionization of the eyeball, describes a new model of combined eye cup and electrode. His apparatus consists of an ordinary glass eye cup through whose wall is inserted on the one side an electrical terminal, and on the other side a compressible rubber bulb for introducing into the eye cup at the proper time the fluid through which it is desired to ionize the eye. A small opening is also left in what would normally be the floor of the cup for the escape of air as the fluid is introduced. The patient is placed on his back, the eye cup applied, and the solution introduced into the cup from the rubber bulb. Where the treatment is to be of long duration, the cup may be retained in place by means of a rubber band passing around the patient's head.

**Urta** strongly recommends the employment of high-frequency currents in the treatment of various ocular disturbances, including corneal opacities, corneal ulcers, optic neuritis, and iritis.

**COLLYRIA.** **Macht** briefly refers to the literature of poisoning by absorption of small quantities of drugs instilled into the conjunctival sac. Such reports include examples of idiosyncrasy to cocaine and atropin. Macht has himself found by experiments upon dogs that vomiting may be produced by the introduction of apomorphin into the conjunctival sac.

**SUBCONJUNCTIVAL INJECTIONS.** The paper by **Jones** reiterates in some detail the general results with subconjunctival injections of cyanide of mercury which have been obtained by him in the past thirteen or fourteen years. Almost any formula may be used, so long as a sufficiently intense reaction is produced. Personally, Jones uses two cubic centimeters or half a fluid dram of a one to fifteen hundred solution, to which are added some acoin to lessen the resulting pain, a little boric acid to avoid precipitation of the acoin by a trace of alkalinity, one-eighth to a quarter grain of morphin to relieve the pain following the injection, and usually about a quarter grain of dionin. One prerequisite of the procedure is long continued and free use of cocaine, a little of which is also put into the unoperated eye. The duration of the pain ranges from the extremes of a child permitting injections in both eyes in a bad case of double interstitial keratitis, without moving a muscle or making the slightest moan, to an adult howling from its use in one eye.

**Reber** was in the habit of subjecting all his cases of hypopyon ulcer of the cornea at the Philadelphia General Hospital to subconjunctival injection of a one to one thousand solution of bichlorid of mercury, and the results excelled those obtained by any other method. Oxycyanid of mercury he preferred to use in greater dilution, one to five thousand or one to eight thousand; and this solution was reserved for choroidal lesions, in which it was valuable if the lesions were recent and



not due to tuberculosis. He obtained anesthesia in such cases with four instillations of a four per cent solution of cocain, followed by three to four minims of one per cent acoïn solution; five minutes after which fifteen to twenty minims of the mercurial agent were introduced.

**Lamb** has found satisfaction in the use of salvarsanized serum injected subconjunctivally for a variety of syphilitic eye conditions, including iritis, iridocyclitis, keratoiritis, and interstitial keratitis.

**MYDRIATICS.** The occurrence of undesirable results from the use of atropin is reviewed by **Matthews**. He reports the case of a woman of seventy-one years, who, twelve hours after a cataract extraction and the subsequent use of a drop of atropin in the eye, became very sick and faint, complained of difficulty in swallowing, and developed dyspnea. The breathing was of the Cheyne-Stokes type. She recovered after treatment by strychnin and other remedies ordinarily used for collapse.

A case of duboisin poisoning is reported by **Northrop**, in a woman of twenty-six years. The patient had an indefinite history pointing to tuberculosis, with a positive tuberculin reaction. A year previously the urine had been found perfectly normal. Homatropin having failed to produce satisfactory cycloplegia, a solution of duboisin, one-quarter grain to one dram, was used, one drop in each eye three times daily for two days and part of another. On the afternoon of the third day, vesical tenesmus developed and pure bright blood was passed from the bladder. The urinary condition lasted for almost a week. The temperature rose to 102 degrees and the pulse to 112, and there was vomiting. After a temporary improvement a recrudescence occurred, with severe pain, severe hemorrhage from the urinary tract, temperature of 105 degrees and pulse 140. The symptoms gradually subsided under medical treatment.

**SILVER SALTS.** **Diaz Rodriguez**, desiring to use iodid of silver in the treatment of opacities of the cornea,

found it convenient to prepare the following solution: Iodid of silver one gram, twenty per cent solution of sodium hyposulphit ninety-nine grams. The iodid of silver is insoluble in any of the liquids ordinarily used in preparing solutions for use in the eye, and the strength of sodium hyposulphit given is the least amount sufficient for preparing a one per cent solution of the iodid of silver.

**Paradies** employs a singular combination of drugs in what he calls antagonistic therapeutics, for the treatment of conjunctivitis which is refractory to specific chemotherapy. At the office two or three drops of a 5 to 10 per cent solution of dionin are instilled into the conjunctival sac, after which one or two drops of a 0.5 to 1 per cent solution of argaldine are instilled. On days alternate with this treatment a 0.3 per cent ointment of corrosive sublimate is employed in the conjunctival sac.

**ANTISEPTICS.** A valuable review of the literature with regard to the use of ethylhydrocuprein in diseases of the eye is contained in the article by **Zentmayer**, who also reports briefly eight personal cases in which this drug was used for pneumococcus ulcer of the cornea. He regards ethylhydrocuprein or optochin as a valuable aid in the treatment of pneumococcal infections of the eye, the drug often acting as a specific in pneumococcal ulcers of the cornea, especially if the treatment is begun before active tissue destruction has occurred. **Basterra y Santa Cruz** gives a useful discussion of the therapeutic value of ethylhydrocuprein in ophthalmology. He concludes that it is the best treatment which we possess at present for combating pneumococcal serpiginous ulcers of the cornea. After its use the scars are smaller and less dense than after other forms of treatment. But in advanced cases the benefit obtained is little or none.

In Europe optochin has apparently been used rather extensively for the internal treatment of pneumonia. **Von Hippel** describes a case in which a man of sixty-two years was treated by his son, a physician, with 0.25 grams of

optochin six times daily. After two days of this treatment Von Hippel was called on account of disturbance of vision, which proved to be lasting in character. Von Hippel was able to collect from the literature about two dozen cases in which optochin was reported to have produced temporarily complete blindness; persistent disturbance being recorded in eight of these cases. He protests that the literature concerning the internal use of this drug treats the visual disturbances as accessory phenomena of little importance. He considers that the drug should not be recommended for use in general medical practice.

In the first of the two cases reported by **Pincsohn**, the cloudiness of vision and marked contraction of the retinal arteries caused by the use of the drug disappeared rapidly and entirely after omission of the remedy. In the second case there was bilateral blindness, with contraction of the retinal arteries. Later on, the vision improved, but the visual field was contracted on both sides, the discs remained pale, and the narrowing of the arteries persisted. At the end of two months there was a complete return to normal vision, but the ophthalmoscopic picture was unchanged.

**Hesse** describes his results in the treatment of infectious ophthalmias with Merck's animal blood carbon. In five cases of acute gonococcic conjunctivitis, four in the new-born and one in a child of two years, the carbon was insufflated twice daily into the conjunctival culs-de-sac as far as the transitional folds. One hour later the cul-de-sac was washed out with a solution of potassium permanganate. After a few days the secretion had entirely stopped. There was no progression in a case which had developed an ulcer of the cornea, and the cleansing and epidermization of the ulcer took place with extraordinary rapidity. In three cases of membranous conjunctivitis the secretion dried up rapidly, and the membranes were rapidly thrown off. In an especially severe case of serpiginous ulcer of the cornea, with perforation imminent, and a hypopyon extend-

ing two-thirds of the way up the anterior chamber, perforation did not occur, and the ulcer retrogressed.

**ANESTHETICS.** **Darier** refers to experiments which have been made in a London laboratory with colloidal cocaine. Experiments on animals gave very favorable results as regards the absence of toxicity and the possession of excellent anesthetic quality.

**SYSTEMIC REMEDIES.** **Lamb** is enthusiastic concerning the effects of fibrolysin in various ocular diseases, chiefly those in which it is desired to promote absorption of exudates or inflammatory products. In some cases he instilled the drug into the cul-de-sac, while in others subcutaneous injections were given. The cases described include several in which hemorrhages had occurred in various parts of the eye, corneal ulcers, iridocyclitis, possible tuberculous keratitis, and choroiditis. Occasionally the subcutaneous injection was followed by marked depression. **Reber's** paper on some phases of modern ocular therapeutics discusses in a discursive way several measures of systemic treatment for eye diseases, including pilocarpin diaphoresis, as applied to retinitis pigmentosa, optic neuritis, and choroiditis; hormone or organotherapy; and vaccine and serumtherapy.

**McDonagh**, and at second hand, **Darier**, whose discussion of the use of intramine, a sulphur preparation, in the treatment of syphilitic conditions was referred to in the last volume of the Year Book (v. 13, p. 35), again discuss the subject, although as related to syphilis generally rather than especially to syphilitic eye diseases. McDonagh now favors the combined use of mercury and intramine, and lays special stress upon the value of the sulphur in intramine for the purpose of putting a stop to excessive systemic action of mercury where intensive use of the latter drug has been resorted to. Darier's consideration of preparations of arsenic occurs in a section of his compendium and repertory of ocular therapeutics, which is to appear in book form "after the war."



## OPERATIONS.

M. URIBE-TRONCOSO, M. D.

NEW YORK, N. Y.

In this section of the digest only general operative procedures are reviewed. All particular operations will be found under the heading of the portions of the eye on which they are practiced, or in connection with the diseases which render them necessary.

**STERILIZATION.**—For keeping the field of operation aseptic, **Dubar** recommends the use of a paraffin film (Ambrine). After thoroughly disinfecting the forehead and lids on both sides and drying the parts either with sterile compresses or with an electric dryer, a layer of ambrine is applied with a brush, first in the eye-brows following the direction of the hairs. The eye not to be operated is then closed and covered with a film of ambrine. The eye under treatment is painted with the brush from the aperture of the lids upward to the hair and down to the mustache, by centrifugal movements. Perforated compresses can then be fastened to the eye. This film is easily detached when desired. (See below Dressings, page 13.)

**LOCAL ANESTHESIA.**—**Seidel**, continuing his work on local anesthesia (Y. B., v. 12, p. 34), applies a similar method to the Kroenlein operation, in cases of orbital diseases in which the opening of the external bony wall is necessary. After disinfecting the skin with tincture of iodine, infiltration anesthesia is made with 6 ccm. of a 1 per cent novocain-adrenalin solution. The injection needle is then inserted at the upper outer angle of the orbit and 5 ccm. of a 4 per cent solution of novocain-adrenalin are injected, one after the other, into the anterior, middle and lower third of the inferior orbital fissure; 6 ccm. of the 1 per cent solution are then pushed on the posterior surface of the front-sphenoidal process of the malar bone, and finally the needle is carried from the lower orbital fissure to the lower outer angle of the orbit to a depth of from 3 to 4 cm. and 3 ccm. of the 2 per cent solution are injected.

After resection of the bone about 2 ccm. of the 2 per cent solution must be injected around the optic nerve near the apex of the orbit.

**Seidel** claims that this method is without danger, easy to perform and affords both marked freedom from bleeding and complete analgesia.

**Maddox** obtains contact anesthesia for the excision of tarsal cysts and even anesthetizes ocular tendons before the operation of advancement, by means of small discs, lint-like on the one surface and with an impervious backing of thin rubber on the other. The warmth of the eye makes the discs a little softer almost at once. In this manner the strength of the anesthetic is exerted in one way only, and replaces with advantage the small cotton swab soaked in cocain usually employed in minor operations. The discs are impregnated with 10 per cent cocain during manufacture and then allowed to dry. From a quarter to half an hour is necessary for the cocain to act.

In view of the pain which frequently accompanies the excision of the iris in glaucoma and even in cataract, **Santos Fernandez** advises subconjunctival injections of 1 per cent cocain solution made in the inferior fornix before iridectomy, trephining, Lagrange operation and even in cataract extraction. Chemosis in acute glaucoma does not contraindicate the injection.

**GENERAL ANESTHESIA.**—**Pottenkofer**, reviewing all the methods of narcosis, advises to mix great quantities of air with the chloroform in the beginning of the anesthesia, for which purpose he directs the patient to speak or count aloud. Post narcotic accidents, he says, can be prevented by the use of scopolamin-morphin.



**INSTRUMENTS.**—Finding it difficult to make the corneal section for cataract when the patient's eye is small and deeply situated, **Black** has devised a new cataract knife with the blade offset as shown in the illustration. One for the right and another for the left eye are necessary.

**Oda** uses a new fixation forceps for holding the lid in an everted position during the excision of the tarsus or retrotarsal fold. One blade consists of a broad, slightly round plate, and the other of a smaller plate with minute teeth.

In order to facilitate the application of the trephine, **Onishi** makes the excision of the corneal layers with a special knife of his own make.

**DRESSINGS.**—**Dubar** speaks highly of the advantages to be derived in ophthalmic practice with the dressing of ambrine (paraffin) devised by **Barthé de Sandfort** in 1902. He claims it is aseptic, does not soil the skin or the clothes, maintains an equal temperature slightly superior to the body, on the parts covered, is easily handled and specially easy to be removed. Moreover it assures the perfect occlusion of the covered parts without preventing perspiration, and preserves them from external contacts.

As it is not irritant it can be applied on fresh wounds, but the infected ones may also be treated successfully in this way. Its special indication, however, is in burns of the eyelids or face. After washing and disinfecting the affected parts, they are thoroughly dried with aseptic compresses or by means of an electric dryer. A film of paraffin is applied with a brush at a temperature of 50° to 60° Centigrade. When cold a thin layer of cotton is extended upon it, and fixed by a second application of ambrine. A large pad of cotton and a bandage may be applied afterwards.

In conjunctival and corneal wounds when symblepharon is imminent, **Dubar** advises the application of the paraffin film directly upon the raw surface in order to form a layer of a foreign substance which prevents the adhesions.

This dressing is recommended also in hordeolum to replace the old poultices, in blepharitis for making a mechanical epilation when the film is taken away, and in zona ophthalmica because its application quickly relieves pain. In gonococcal ophthalmia a shield is easily made for the good eye with a wire frame, gauze and ambrine. In cataract operations it affords a hard protective shield and avoids the compression of the eye produced by ordinary dressings. Finally, in plastic operations, dermic and epidermic grafts are kept in position and protected with the film.

**SPECIAL OPERATIONS.**—**CORNEAL GRAFTING.** **Teulières** and **Ourgaude** used the conjunctiva incised all around the cornea to keep in place and protect a corneal flap made by a piece of shrapnel in the eye of a German prisoner. The projectile cut away the anterior lamellae of the cornea without leading to perforation, and a tongue-shaped flap of corneal tissue, about 6 mm. long and 3 mm. wide, was produced, and remained adherent by a pedicle to the limbus. Although the patient was seen twenty-eight days after the injury, the wound was not infected. The corneal flap was thick and opaque, but after being replaced and kept in position by the detached conjunctiva sutured horizontally below and anchored to the sclera by two intrascleral stitches, the flap wonderfully regained a complete transparency; and at the end of one month only faint traces of the borders of the graft remained in the cornea. The pedicle attached certainly contributed a good deal to this ideal result.

**OPPORTUNE OPERATIONS.**—Against the opinion of **Valude**, who claimed that some operations are inopportune when performed on soldiers at the front or in active service elsewhere, **Chappé** thinks that the operation for strabismus, even when binocular vision is not reestablished, is useful because it removes an apparent defect of which the soldier takes advantage for asking to be placed in the auxiliary army. The diplopia which sometimes supervenes after the operation can be removed by

suitable orthoptic exercises or by a second intervention. Nebulas and leucomas of the cornea are also pretences for avoiding entering into active service in the army. One-sixteenth of the patients examined by Chappé showed this condition, which in some cases can

be greatly improved by iridectomy. The operation of pterygium is necessary in some soldiers for keeping them at the front; and in cases of transference into the auxiliary army on account of this ailment, may send back to the front many useful men.

## REFRACTION.

THEODORE B. SCHNEIDEMAN, M. D.

PHILADELPHIA.

This digest covers the literature referring to Physiologic Optics and the Anomalies of the Refraction and Accommodation of the eye and their treatment from January first to November thirtieth, 1917.

**BICYLINDRICAL REFRACTION.**—**Prentice** again emphasizes the fact that the dioptral formulae established by him in 1888 are still the simplest extant for solving the problem of bicylindric refraction; they prove mathematically that superposed cylinders crossed at any angle are equivalent to some ordinary sphero-cylindric combinations. Every aspect of the refraction by bicylindric lenses will be found fully discussed in his treatise on Ophthalmic Lenses. Incidentally he calls attention to the fact that several authors have quite recently given the wrong formula for the horizontal and vertical refractive powers. For a cylinder whose axis is placed at an angle  $\beta$  with the horizon, the correct formula is:

$D_h \sin^2 \beta + D_v \cos^2 \beta = D$ , the maximum dioptral power of the cylinder at right angles to its axis. In this equation  $D_h$  and  $D_v$  designate the same dioptral factor,  $D$ , in the horizontal and vertical planes.

**OPTICAL GLASS.**—**Rosenhain's** Cantor lectures on optical glass, before the Royal Society of Arts, have been brought together in a pamphlet. The first lecture deals with the requirements of optical as opposed to ordinary glass, and gives some account of the tests with which it must comply. The remaining two deal with the progress of manufacture and the possibility of simplifying and rendering that process a more certain one.

A new department of Technical Optics is to be established in connection

with the Imperial College of Science and Technology, South Kensington, London.

**SKIASCOPY.**—**Blanco** gives a lengthy and complicated account of the phenomena of intraocular illumination in the shadow test, by the study of the image of the observer's pupil as formed in the observed eye, employing the analogy of sunlight falling upon the wall of a house when admitted through a door or other opening. The illuminated area of the wall shifts with the position of the sun in relation to the opening.

The same writer criticises the various appellations which are commonly applied to this test; he suggests a Spanish word "cineluzcopia," which term appears to connote both movement of light and also inspection and exploration.

**SUBJECTIVE TESTS.**—**Gradle** calls attention to the imperfections of the refracting media of the eye on the one hand, and the inflexibility of the laws of optics on the other, from which two factors results the inconstancy of the eye in its optical relation to the constancy of the rays of light. As, however, optical physiology is not strictly mathematical, nature aids by certain broad compensations. The character of these compensations is not fully understood, nor is their extent completely known, for it varies in each individual and never remains the same in any one person, from which it follows that the duty of the ophthalmologist is to corre-



late the optical constants of light with the optical inconstants of the eye, taking into due consideration the physiologic compensation of nature. It is these uncertainties which make refraction not a science, but an art and a distinctly individual one at that, permitting different methods for the attainment of the same end.

**Crisp** combines the use of the cross-cylinder and astigmatic dial in estimating the refraction. After obtaining an approximate estimate of the spherocylindric combination required, he employs the cross-cylinder to fix the axis exactly, and next estimates the two principal meridians with the astigmatic chart. He finds it advantageous at times to combine the chart and cross cylinder even more intimately by employing the chart itself for determining the strength of cylinder and direction of the principal meridians with the aid of the cross cylinder; the latter being used to discover what strength of cylinder makes the principal meridians of the chart most closely resemble one another; or if the axis is to be determined, which way the whole dial appears of more uniform intensity. In testing his own eyes, he finds it strikingly easy to detect the difference in uniformity of the lines by revolving a cross cylinder as weak as  $+0.12$  sph.  $\ominus -0.25$  cyl.

The essential point in what **Potter** calls his "comfort test" consists in having the patient wear, for trial for a short time, the combination of sphere and cylinder determined without a cycloplegic by means of a fogging method. For this purpose a large number of spherocylinders (something less than 200 pairs will duplicate practically every ordinary combination; a much smaller number if carefully selected will suffice), are kept at hand so as to be readily mounted in a temporary frame. With these the patient tests the result of the refraction as previously determined as to the comfort he derives from the glasses. The experience so obtained, whether the glasses give satisfaction or not, is to serve as an indication of the correctness of the results of the refractive test.

**TRIAL LENSES AND OPTOMETER.**—The principal features of the Bausch & Lomb Optical Company's new form of ophthalmic test lenses, as they are stated by **Poser**, are their small size—but 15 mm. in diameter—and their shape, being plano-convex, of uniform thickness, so that the principal points occupy the same relative position. In testing the refraction, the spherical surfaces are placed toward the patient's cornea; when a cylinder is required, its plane surface is placed in apposition with the plane surface of the sphere, thus securing the same distance between the principal plane of the two lenses. The same firm has introduced a portable ipso-phorometer for which certain advantages are claimed. Ocular demonstration is required for a satisfactory comprehension of the instrument.

**CYCLOPLEGICS.**—The literature of the year exhibits an undoubted tendency in some quarters to question the necessity of a cycloplegic in estimating the refraction in every case in young persons. Writers, however, are inclined to generalities upon this subject, and show a lack of definiteness as to the indications in favor of, or against, the necessity of these agents. Several papers bearing upon the subject are considered below.

After laying down both the advantages and disadvantages of cycloplegia as an aid in the measurement of the refraction, and also the undesirable effects of cycloplegia, **Jackson** raises the question as to the possibility of satisfactorily measuring the refraction without such aid. Admitting the real difficulty to be "that until a cycloplegic has been resorted to, no one can know with certainty whether a particular patient can fully relax his accommodation or not, a single guess may be brilliantly accurate. Repeated guessing may arrive at a result nearly always correct; but if scientific accuracy is of sufficient importance, every method that conduces to it is worth using." He does not allow that the mere age of the patient, or the state of the refraction, whether hyperopic, myopic, or astigmatic (though the latter is an im-



portant indication for cycloplegia), nor even the presence of possible symptoms of glaucoma, are alone sufficient to decide the question. In his own practice he has been using cycloplegia in two-thirds of his patients under 40 years of age, in 6 per cent of those between 40 and 50, and in a very small fraction of 1 per cent over that age. He properly insists that the accompanying dilatation of the pupil magnifies the effect of the imperfect focusing, and so makes the subjective tests more exact. This is particularly valuable when astigmatism is present. He concludes that in this matter of the use of a cycloplegic, there is occasion for carefully considering all the factors in any individual case; there is need, not for rigid rules, but for the ripened conscientious judgment of the scientifically trained physician.

Tilderquist, while admitting that cycloplegia is the most exact method of determining the refraction, calls attention to certain difficulties and chances for error inherent in the method. These consist principally in the varying power of the ciliary muscle in the different forms of ametropia, being hypertrophied in hyperopia and weakened in myopia, so that over-correction is a common pitfall to which cycloplegic measurement may lead both in hyperopia and myopia. Considering that astigmatism shall be fully corrected except in special cases of very high error, he limits the discussion to the prescribing of the proper sphere. As regards hyperopia, the aim should be to give the greatest correction possible, as is generally practised in this country, so as to place the eye in as nearly a normal condition as possible.

The question then is how to determine after a cycloplegic how large a sphere the patient will accept with comfort. This may be settled by trying the patient out after the ciliary muscle has recovered from the cycloplegic. An objection to this plan lies in the fact that the advantage of more ready acceptance of the correction while the eye is more or less under the influence of the cycloplegic, is lost. Among the most important factors to

be considered in this connection are—Age: Children will accept a larger correction than adults. Occupation: Those who use their eyes a great deal for near work should be given a fuller correction than those who do not. Esophoria and exophoria: As the convergence is intimately connected with the accommodation, a fuller correction will be tolerated in esophoria where the relief to excessive strain of accommodation will tend to reduce excessive stimulation to the interni; the opposite is the case in exophoria, where a weaker convex lens is called for. Manifest hyperopia: Where a large proportion of the hyperopia can be made to become manifest a fuller correction will be tolerated than where this is not the case.

If it is difficult to secure definite rules as to the correction of hyperopia, it is many times as difficult to lay down definite laws for myopia. The factors involved are many, varying from the condition of the patient's eyes to that of the general health. After careful measurement of the accommodative power present, the basic principle to be followed is that the myope should be compelled to use as much accommodative power as is possible without doing damage, and this power should be increased by training. Two main considerations must be taken into account—age and the degree of myopia. The writer approves of the working rule in practice that in hyperopia the younger the patient the greater percentage of correction will be tolerated. Although the accommodative power of a child is high, the proposition of available accommodation is lower than in adults whose accommodation has declined with years. In myopia also the full correction can be borne in young subjects while an allowance must be made for a weakened ciliary muscle with advancing years. The writer then proceeds to give figures which are well shown graphically, in which the relation between the age, the degree of ametropia, both H. and M., and the strength of glass to be prescribed are set forth.

*Continued next month.*

# DIGEST OF THE LITERATURE.

## REFRACTION.

THEODORE B. SCHNEIDEMAN, M. D.

PHILADELPHIA.

*(Continued from January issue)*

**Crawford** has addressed a questionnaire to 90 eye specialists of this country asking their practice as to the use of cycloplegics in refraction. A large majority considered such to be necessary, though there was some divergence as to the proportion of cases in which it need be employed. Homatropin and atropin were the drugs used with very few exceptions.

In insisting upon the need of cycloplegics in refraction work, **Clarke** states that in the absence of a cycloplegic a different result can be obtained at every examination, as it is impossible to determine accurately the degree and axis of a weak cylinder. In proof of this he has carefully determined the refraction of many young patients before and after paralysis of the accommodation: in not a single case did the two agree. He maintains that inaccurate refraction which leaves a slight, but different error from that which was originally present, may cause eyestrain which had not been present before, because the ciliary muscle is now able to correct the new resulting error when it could not deal with the original larger one.

**CHANGE IN REFRACTION.**—**Risley** reports a case in which the refraction, from having been hyperopic astigmatism, developed into myopia of  $-4$  and  $-2.25$  respectively in the two eyes, with vision  $6/15$  and  $6/60$ , following increased tension with numerous exacerbations; and final almost sudden subsidence of the hypertension, in an aged woman subject to arthritis deformans. The change in the refraction was accompanied by obvious thinning of the anterior ciliary region and a groove like formation surrounding the cornea just back of the limbus with tension normal in both eyes. There

were no demonstrable changes in the crystalline lens to account for the increased refraction.

**MYOPIA.**—To cure myopia, **Bacchi** advocates progressive pressure in the antero-posterior direction by means of the apparatus of Roger d'Ansan with a view to shortening and widening the globe. He reports favorable results following a few sittings.

Among various phases of myopia brought to light in **Masuda's** statistics, the most remarkable is that in 20 per cent the myopia was found to be hereditary. Macular changes appear earlier and are usually of a more severe character in women than in men. Illustrations of various macular changes are appended. The vision with equal errors of refraction, and in spite of early and full correction, is apt to be lower in women than in men.

**Harriet Gage** summarizes a study of myopia, including myopic astigmatism, from the Massachusetts Charitable Eye and Ear Infirmary during 1915. Of 1,524 eyes the refraction was below 3D in 56 per cent; 20 per cent were between 3 and 6D, and 20 per cent were cases of high myopia (from 6 to 15D). Only  $2\frac{1}{2}$  per cent showed very high myopia, above 15D. Of 1,696 myopic eyes 54 per cent showed no astigmatism; 36 per cent presented compound myopic astigmatism, and 10 per cent simple. The same paper deals also with the age, sex, visual acuity, including the sociologic as well as medical aspects of such patients, and should be consulted in the original.

**Muirhead** opposes the doctrine that the action of the external muscles tends to raise the intraocular tension and to cause lengthening of the globe. He believes that the opposite is the case, in that the action of the muscles tends to



cause an antero-posterior flattening. When the recti are divided, the eyeball moves forward, showing that it is held back by the tonicity of the muscles—an impulse not due entirely, he thinks, to the elasticity of the retro-orbital contents, but partly to the elastic recoil of the eye itself. Another argument which the author takes up is afforded by the change in the apparent size of objects. According to the usual hypothesis, pressure is greatest when the eyes converge. As the eye must elongate under this pressure the apparent size of the image should enlarge. The author states that it diminishes. The author is greatly opposed to full correction of myopia, holding that persons wearing a full correction are always uncomfortable and suffer from eye-strain. The above is a short résumé of some of the theses maintained by the author in his book. The reviewer believes that every one mentioned is inadequately proven and indeed leaves the question where it was. Those who desire to go into the subject from the author's standpoint must be referred to the work itself.

In view of the wide prevalence of myopia in Germany (each year about 9,000 recruits in the Germany army are held back on account of eye affections, the great majority of which are myopes belonging especially to the better classes), the military authorities have attempted, immediately after the declaration of war, to perfect the military education of the younger classes by training exercises (among other factors) of distant vision, estimation of distance, etc. In this connection **v. Ziegler** relates his personal experience in such training. He had the myopes remove their glasses and exercise their distant vision on targets successively smaller in size. At the end of 6 months all were able to recognize the smallest of the targets. Other exercises in different maneuvers in maintaining straight or oblique directions of march, parallel or perpendicular courses, etc., were also practised with success.

**ASTIGMATISM.**—**Nordensen** remarks that although the question, whether in

a given case the astigmatism should be corrected or not, occurs daily and is important and complex, it has been little debated in ophthalmic literature, and the text-books give only vague directions on the subject. (This may be true in Europe, but there is certainly no lack of literature upon the subject in America, in which country there is substantial agreement among oculists generally upon the point in question.—Rev.) This writer reviews the rules for and against the correction of astigmatism. In general, he thinks correction is needed only if it increases visual acuity, (i) where such increase is needed, such as may be called for by the individual's occupation or during the period of education in children. (ii) Asthenopia—chiefly of two kinds: (a) accommodative asthenopia. He refers this form to the contraction of the pupil which occurs during accommodation and improves definition by cutting off the peripheral rays; this advantage is obtained by some ametropes by excessive accommodation, bringing the p.p. too close and so interfering with sharpness of vision for near work. The patient therefore relaxes the accommodation, the size of the pupil increases, he reverts again to accommodation, and this alteration produces fatigue and strain. (b) Eyelid Asthenopia. This kind of asthenopia is due to strain of the orbicularis muscle, which can be used to correct inverse astigmatism by the pressure it is capable of exerting in a vertical direction upon the globe. As much as 2 or 3D. can be compensated in this way, but the excessive action of the orbicularis leads to fatigue. (c) Dangers to the eye involved by astigmatism, as favoring the development of strabismus or myopia. In nervous affections, such as epilepsy, migraine, headache, etc., the astigmatism should also be corrected. Among the contraindications he includes: the inconvenience of wearing glasses, when, for instance, one eye is normal and the other astigmatic; nonimprovement of visual acuity after the correction has been worn for some time; intolerance of correction, as in elderly patients in whom the principal meridians do not coincide



with the vertical and horizontal planes, etc., etc.

He rejects the view which has been advanced in recent years as a reason for not correcting astigmatism in children that the anomaly may even disappear spontaneously if it is left uncorrected.

**EFFECTS OF UNCORRECTED REFRACTIVE ERRORS.**—**Carhart** insists upon the necessity of careful examination of the eyes of school children, particularly those who appear to be deficient in their studies. He summarizes the result of the examination made 20 years ago, of 1,000 school children of various ages in two village schools; not only those suspected of ocular defects but all the children in the classes from kindergarten through high school. The children were largely American born, in whom the errors of refraction are less common and of lower degree than among a foreign-born city population. He found of emmetropia 13 per cent, hypermetropia 36.20 per cent, C. H. astigmatism 44 per cent, myopia 1.40 per cent, C. M. astigmatism 3.50 per cent, mixed astigmatism 1 per cent. The following table shows the percentage by ages of the various errors in the same 1,000 children:

	5 to 8 yrs.	9 to 12 yrs.	13 to 18 yrs.
Emmetropia .....	10.00	16.43	14.33
Hypermetropia ..	53.48	37.27	22.87
C. H. astigmatism	33.48	40.05	58.55
Myopia .....	0.87	1.85	1.17
C. M. astigmatism	71.74	3.01	5.26
Mixed astigmatism	0.43	1.39	0.88

The rapid decrease in the percentage of the short, immature hypermetropic eye as the child develops is strikingly shown in this table, as is also the irregular yielding of its structure as shown in the increase of astigmatism. In contrast with these statistics of the eyes of school children of all ages, the same writer has examined 87 children from the kindergarten and first grade of the public schools of New York. This survey, while it shows the existence of refractive errors even at that tender age, indicates that they do not occur in so great a percentage or to so high a de-

gree as in later years—thus demonstrating the effect of the school in augmenting such anomalies and the necessity of preventing the same as far as possible by appropriate correcting glasses. In 23 per cent of the same children the refractive error was sufficient to require correcting glasses.

**Wessels** reports some interesting cases of refraction from thousands of children whose refraction he has measured as ophthalmologist to the Philadelphia Bureau of Health. In one family of six children, each had hyperopia of not less than 14 and not above 18D. In a colored family of myopes, the youngest of six had 6D myopia and 2 of astigmatism, again the oldest of eight had 17D of myopia with 3 of astigmatism. The highest myopia occurred in a child of 14 with —27D. Sph. combined with —4. cylinder. He urges that myopic children should be taught in special classes—as more important even than special classes for the mentally defective.

**Scott** calls attention to the relation of eye-strain to headache and other reflex nervous conditions. He makes a plea for the proper correction of ocular defects which lead to strain, and the evils that result from the growing tendency of state legislatures to permit this work to be done by incompetent persons. He details several interesting cases showing the good effect of correcting glasses in relieving various severe functional anomalies of nervous origin.

**Bruner** calls attention to the influence of errors of refraction, or failure in the power of accommodation, or muscular imbalance or weakness of the extraocular muscles as a cause of various forms of headache. He dwells upon the importance of slight errors as against high errors in the production of symptoms, and that the mere fact of normal vision with or without glasses is not proof in itself that uncorrected error is not present. He lays stress upon the necessity of a cycloplegic in young subjects, and sometimes too in older ones. In this connection it is necessary to bear in mind that a number of different conditions may co-

operate in the production of symptoms and that each and all of these should be investigated and receive attention.

**Corry and Shanker** emphasize, not to say exaggerate, the influence of eye-strain in the causation of local and general symptoms. They find "that not only the symptoms of watering of the eye, itching, redness, blinking, sneezing, intolerance of light, headache, burning feelings in the eyelids, head twitching, pain in the neck, vertigo, neurasthenia, and sexual impotence, etc., are due to eye strain; but also different varieties of conjunctivitis, acute and chronic, follicular conjunctivitis, trachomatousum, eczematousum, pterygium, xeroses, keratitis, pannus, symblepharon, corneal opacity, episcleritis, iritis, cyclitis, choroiditis, glaucoma, cataract, retinitis, optic neuritis, amblyopia, ptosis, blepharitis, hordeolum, chalazion, trichiasis, en- and ectropion, blepharospasm, dacryocystitis, diplopia, squint, nystagmus, nasal catarrh and its complications, etc., are also directly or indirectly traceable to eye strain." They agree with Walter of Odessa that trachoma is not a disease sui generis, but expresses the reaction of the conjunctiva to various irritants, which irritant is, in their opinion, nearly always eye strain from refractive error or muscular imbalance. A considerable number of brief histories in support of their contention are appended.

**Kahn** writes a paper intended to give the general practitioner a few helpful hints and rules to judge the success or failure of the glasses prescribed. The practitioner should first of all have a thorough knowledge of the symptoms of eye strain,—a matter very generally neglected in medical colleges. He insists upon the advantage of spectacles over eyeglasses and upon the importance of correcting astigmatism. He goes so far as to say that "any lens that does not show an astigmatic correction is presumably incorrect." He gives a homely but striking illustration of the different kinds of refractive errors by comparing the eyes to a two-wheeled vehicle of which the wheels may both

be of the proper size, or both too small or too large, or one larger than the other, or one or both wheels elliptical in shape, in which latter case the long diameter of the ellipses may be parallel, or take any position whatever. He insists upon the value of a cycloplegic in measuring the refraction. He gives an explanation of the complaints which even properly fitted glasses may occasion when first worn, and the necessity of a little patience in becoming accustomed to the correction. For presbyopes he advises, besides a bifocal combination, a separate pair for prolonged near work. Finally, as the eye is a living, changing organism, and the correcting lens is unchangeable and stationary, he insists upon the necessity of repeated examinations, which are not to be regarded as a confession of unsuccessful previous refractions. **Hartshorne** emphasizes the close relations between the motor and sensory nervous supply of the ocular mechanism and the sympathetic system, and that ocular malfunction is a definite and frequent source of irritation of the sympathetic system resulting in symptoms of distant organic disorder.

**Koster** calls attention to the persistence of accommodation in certain elderly persons until unusually late in life, associated with asthenopia. He warns, however, that certain conditions such as senile myosis and incipient cataract may simulate accommodative power. He describes 4 typical cases in persons in the fifties and sixties who appeared to possess 3, 4, or 5D. of accommodation. He has no explanation to offer but thinks that the condition cannot be explained by von Helmholtz's hypothesis.

**ACCOMMODATION.**—**Kagoshima** found the amplitude of accommodation among young Japanese to be about the same as in Europeans. The remarkable feature of these studies was a sudden increase 0.6—0.7D. in girls between 15 and 16 and boys between 16 and 17.

**Fulkerson** advocates close cooperation between the dentist and the ophthalmologist. The Roentgen ray, he thinks, should be resorted to more



often in errors of refraction which correcting glasses do not relieve. The absence of cavities in the teeth is not of itself a sufficient criterion that there may not be an impacted molar or blind abscess that irritates just enough to interfere with normal accommodation. He reports in some detail a half dozen cases in which the symptoms of accommodative asthenopia were present, and which were not permanently relieved until abnormal dental conditions, as shown upon the skiagram (such as

blind abscesses, etc.), had received proper treatment.

**PRESBYOPIC LENS.**—Hill observes that the ordinary bifocal lens is of no use to the presbyope who uses a head mirror or head light. He accordingly advises that the segment 12 mm. in width by 24 in height be added to the center of the distance correction—an arrangement which offers all the advantages of the presbyopic glass plus ability to see at a distance by simply turning the head to one side.

## OCULAR MOVEMENTS.

WILL WALTER, M. D.

CHICAGO.

This part of the digest gives a review of the literature referring to its subject that has appeared during 1917 to the close of November. After taking up the different departments of the subject it gives a series of important case reports.

My conception of an Editor's function in framing a chapter covering his subject—and to be used in the year book of literature—is that it shall give the essence of all papers published in all languages so far as possible, and without regard to the editor's own ideas of their value. It is proper to leave this evaluation to the reader, who is thus free to determine for himself. But he should be given enough to enable him to so determine and should be saved unnecessary reading of detail, if the chapter fulfills its mission. In an occasional instance, however, the paper is but a review or does not disclose added experience, and in such cases only the title is given, although this plan has to be followed sometimes when the paper is not available for abstract.—(W. W.)

**SUMMARY OF PROGRESS.**—Some points in physiology have had free discussion during the year 1917, notably: (1) Binocular single vision and the function of the oblique muscles. (2) Some new developments in the study of nystagmus have been forthcoming, and the trend is away from the ocular and in favor of the aural origin of this malady. (3) There is an increase in the proportion of paralysis cases of all types and some interesting deductions from them. (4) The correction of annoying abducens paralysis by transplantation of outer bands of the vertically acting recti, thus converting them to abverting functions, has received considerable mention. (5) Reports of effects of war wounds upon ocular movements are beginning to show in the literature.

**ANATOMY AND PHYSIOLOGY.**—Hopkins states that, from many dissections of cranial nerves in domestic animals, he is convinced that the accepted de-

scriptions of the motor nerves are incorrect, in attributing two sources of nerve supply to the muscle retractor oculi found in lower animals. It is innervated exclusively by branches from the abducens. He reviews quite exhaustively the literature on the subject and quotes many authors. His dissections were upon the horse, ox, sheep, pig, dog, cat, and rabbit, and were done under a binocular microscope. He traces the nerves from their superficial origin in the brain to their respective muscles.

Dodge has made a contribution on Visual Motor Function which is of interest from the psycho-physiologic side. Roelofs' paper on the function of trochlear muscles is not available for abstract. Stähli has reviewed the advance in knowledge of the relationship of ocular movements and the ear. He speaks of the newer study as "Labyrinthine Ophthalmostatics." In rotation nystagmus the ear is responsible



for the first phase alone, the brain for the second. Influences of the ear also dominate certain features of miners' nystagmus as well as that of the blind. In his practice at Zurich he has encountered many cases of ocular tremor and pronounced nystagmus in healthy people. He used to ascribe these to difficulty in fixation of the eyes early in life but now believes the ear responsible even for these. The ear-eye movements are observed through nearly the whole animal kingdom, even in invertebrates, and this again indicates the dominance of the ear.

Jones asks the attention of the general practitioner, the otologist, the ophthalmologist, the syphilologist, the neurologist and the surgeon to recent work done on the ear. Only the turning and douching tests are discussed in this paper. The mechanism of the tests and the physiologic features are explained, and the conclusions as to the nerve pathway from the ear to the eye muscles are also given. The tests are of value to the ophthalmologist in diagnosing some eye muscle palsies and locating the lesions causing them. They may also be of use in cases of nystagmus. George endeavors to uphold his theory of oscillation of the eyeball with the macula as the fixed point, and to refute the paper of J. A. Ferree and C. Sheard. (Y. B. v. 13, page 58.)

Blaauw feels that the perception of depth may be as accurately measured as is visual acuity and criticises all of the authorities on the subject of binocular single vision. Also that the mathematic treatment complicates the question and that psychologic explanations are disguised metaphysics. It is a physiologic process. Wheatstone furnished the essential facts. Blaauw makes distinction between simultaneous vision with alternate macular perception, and binocular single vision. 1. He proposes the stereoscopic parallax as the proper test. 2. A close study will disclose cases with absence or imperfectly developed depth perception but without squint. 3. Its presence or absence may explain why results vary after correction of anisome-

tropia; hence: 4. The appreciation of the third dimension has practical value.

In discussion, Lancaster thinks the essayist has undertaken to prove too much in assailing so many authors and traces the evolution of binocular vision phylogenetically and the overlapping of the field in higher form and the development of fusion. Perception of depth is not ocular but psychic. Binocular vision gives a more acute sensation than when one image is suppressed. And when the object is viewed with convergence, and hence from different angles as between the two eyes, the images are combined in consciousness with the added property of depth,—the most delicate of our space perceptions. He does not rate the function very high, since when absent through loss of an eye, there is early adaptation and it is not long missed.

Verhoeff considers that the usual tests, as bird and cage and the like, are not tests of binocular vision; and calls attention to his previously described test employing two circles, one with two vertical lines through it and the other a single line bent in the middle. Subjects with binocular single vision see one circle with two lines bent in the middle. This picture exists in the brain and this evidences the existence of a center for stereoscopic vision.

Stevens calls attention to the inconsistency of the author's claims that the mathematic and psychologic theories fail to explain binocular single vision and then employing the binocular parallax test which is mathematic, and then approving Dove's experiment which employs no eye movement and is hence psychologic. Binocular single vision is a psychologic phenomenon upon a physical basis which every psychologic process has. In fact we employ both physiologic and psychologic processes and must call to our aid mathematic principles to explain their actions. Valk calls attention to the Pfalz stereo-scope as a better test than the author's. Emerson has found the Worth amblyscope the most satisfactory test.

Theobald, as a result of sensing varying shapes and sizes of images accom-

panying definite ocular movements, has concluded that the dominant function of the obliques is to hold the eye forward against the backward pull of the recti. Others have claimed that opposition to the backward pull of the recti was by bulbo-orbital fascia or check ligaments. Theobald claims that the subjective after images are over the oblique insertions in the globe, and stronger and larger where the rotations put the greatest protracting stress.

These claims did not meet with favor in the discussion, which was well balanced, each in discussion supplementing the others to disapprove the claim. Howe maintains that the anatomic arrangement of the obliques gives some forward pull, but offered specimens showing that the capsule forms a sort of cup covering the posterior part of the globe and this prevents retraction. Jackson affirms Howe's statement, adding that both the obliques and the recti draw the eye nasalward. The globe is not held in a fixed position in its hammock of fascia but rolls from side to side and up and down. Valk claims that the only function of the obliques is to maintain the vertical meridians in position and that they have nothing to do with movements.

Duane calls attention to the absence of protrusion of the globes in cases of ophthalmoplegia, and when doing a tenotomy of the inferior oblique no forward movement of the globe is manifest upon traction—the eye ball moves definitely upward. He emphasizes the thought that the obliques take part in all ocular movements.

Lancaster calls attention to the fact that the recti and obliques do not exactly neutralize each other. Opposed to their combined action is a component of fascia and connective tissue and not the single band or check ligament, else there would be limitation to the degree of motion. The ocular muscle could rotate the eye much further except for this tissue. The tropometer measures, not the power of the acting muscles but the resistance of the antagonistic muscle and the fascia, ligaments, optic nerve and surrounding tissues. All muscles, including antago-

nists are concerned in any ocular movement.

Will Walter agrees with Duane and emphasizes that protraction is not a prominent symptom of paralysis of recti, nor does retraction follow paralysis of the obliques. The researches of Fuchs, although made for another purpose, also militate against the view of the author, since in myopic eyes which are prominent the obliques have less forward pull and act more as rotators than in normal eyes. This is due to their insertion in the hind external quadrants. Hyperopic eyes are retracted though their insertion is such as to give a more forward and a less laterally acting pull. If the sensing of images upon rotation proves anything it is only that the obliques take part in all rotations. (This discussion seems to disprove the claim of the author and to establish the fact that the obliques are adjuvant, steadying, corrective muscles taking part in most if not all ocular movements. (W. W.)

Landolt has studied false projection in nondeviating eyes, and cites three cases in which the rotations were measured and compared with projection. The first had esotropia, O. D. fixing and O. S. showing limited rotation. O. D. showed false projection of 6° to the right but after seventy-two hours occlusion the test was normal. The second had 18° of left esotropia and showed in O. D. 10° to 5° of false projection to the right, and in O. S. 4-5° to the left. The third case showed false projection of 6°-8° in the fixing eye. Koster describes an abnormal ocular movement evidenced by divergence upon voluntary lateral rotation without change in accommodation. The malady indicates separate centers for convergence and for lateral rotation.

**INSTRUMENTS.**—Lowell reviews the operations for partial tenotomy offered by Verhoeff in 1903, Todd in 1907, Harman in 1913, and presents a double-jawed fixation forceps to lessen the difficulties of these operations. All cuts in the tendon or muscle are made between the toothed jaws of the instrument. It is made by Codman & Shurtleff, of Boston.



**DIAGNOSIS.**—**Santonoceto** reviews the work of Howe with the Ergograph. **Roelofs** thinks he has a more precise method of measuring paralytic imbalance employing the Maddox Rod. **Antoni** considers the diagnostic import of abnormal conjugate ocular movement.

**Suker** has written an article describing a new muscle symptom diagnostic of exophthalmic goiter, and which he calls "deficient complementary fixation in lateral eye rotations." The sign is made manifest by having the eyes fix an object in extreme lateral rotation, either right or left, then upon rapidly moving the object to the median line notes whether one eye lags in following the object, shown as a transient divergent strabismus. An esophoria decreases the apparent divergence while an exophoria increases it. The diverging eye eventually jumps to proper convergence. The object must be held three or four feet from the patient. This sign is of no value in the presence of a paresis, a paralysis or any marked degree of esophoria or exophoria. **Suker** finds it is about as constant as the von Graefe or Moebius sign. He believes it is due to the same cause as the latter sign, i. e., a dissociation in the functions of the sympathetic and the extra ocular motor nerves.

**Berry** has observed that the pupil contracts when viewing moving, more than still pictures, and when there is a flicker in the motion picture the pupil can be seen to tremble, an effort to follow each fluctuation. He believes this will eventually injure rather than strengthen eye muscles.

**Rousseau** reviews the cases from literature and seen in hospitals presenting ocular muscle paralysis complicating otitis, and endeavors to show association of definite paralysis with localization of lesions. Following is the summary:

Isolated paralysis of abducens—benign—serous meningitis.

Fatal cases—extra dural and cerebellar abscess.

Paralysis of abducens and fifth—benign—osteitis.

Fatal cases—localized meningitis or

extra dural abscess, generalized meningitis.

Abducens and Ocular Motor Paralysis—cavernous sinus thrombosis (Generalized meningitis).

Oculo-Motor paralysis—temporo—sphenoidal abscess.

Paralysis of fourth pair—almost unknown.

**PHORIAS.**—**Kellogg's** paper is on exophoria. **Willetts** treats of the cause, significance and effect of heterophoria on the general system. He defines heterophoria as "simply a functional impairment of the action of one or more of the ocular muscles." If the equilibrium of the eyes is disturbed and binocular vision maintained with difficulty, there is disturbance of the general nervous balance. The causes of heterophoria are metabolic, anatomic,—as errors of attachment and malformation; and pathologic—as paralysis and paresis. Heterophoria produces vague symptoms filling the patient with dismay and concern, and "their significance and effect on the general system is apparent by disturbance of internal functioning organs, autointoxication and ill-defined sthenic conditions."

**Willetts** classifies muscle deviation as dependent upon (1) cerebro-psycho exhaustion; (2) lesions along the nerve tracts, (3) anatomic, skull and orbital malformation, false insertions, etc.; (4) compensatory muscle hypertrophy and muscle degeneracy. He feels that these patients themselves must be classified as well as the heterophorias; and that the correction by lenses or prisms will not avail in the presence of cerebro-psycho exhaustions; and he questions the value of prisms for constant wear since they are liable to increase the deviation they are designed to correct. Neither do prism exercises find favor with him, except in cases of weak muscles following paralysis or paresis or any cases of muscle degeneracy. In cases of orbital malformation false attachment of ocular muscles are compensatory and hence normal for that eye. He speaks of Reber's theory of skull and orbital changes and **Will** **Walter's** suggestion of overtonus as



both clearing the not previously understood changes at puberty.

He asks whether it is not logical to isolate patients suffering from asthenopia and eye distress in a dark room for a week under cycloplegia. He would change the designation of low degree prisms upon prescriptions for opticians, as suggested by James Wallace some years ago, and gives figures for this method of prescribing.

**TROPIAS.**—**Kimberlin** calls attention of the general practitioner to the cross-eyed child. He discusses one cause only, that of over convergence due to excess of accommodation. Three direct effects of squint are considered important, viz., (a) Cosmetic, (b) lack of binocular vision, (c) blindness. He employs the usual means of non-operative correction, but does not believe glasses advisable until two and a half or three years of age.

**Cutler** finds that most infants are hypermetropic, leading to excess of convergence and esotropia; alternating if vision is equal in both eyes, unilateral if unequal. Myopia rarely occurs in infants but is prone to develop during school age, accommodative divergence accompanying it. Myopia cases require full correction under atropin and fusion center training. If operation is ever needed it should be advancement of one or both interni. Heredity should be expected to play a part in strabismus since errors of refraction are so influenced. Cutler uses all the usual means of correction of these cases, refraction, atropin in the fixing eye, occlusion, operation and hygiene. **Poyales** writes on Convergent Strabismus in the New Born.

**Clothier** presents his paper, not because he has anything new to offer, but because there seems to be a prejudice against the early treatment of squint. He reviews the economic loss which results from this, as well as the loss in vision. He employs the usual non-operative treatment including the amblyoscope. This paper does not touch upon operative treatment. **Veasey** regrets that the increase in standards of medical education have not brought out the importance of early recognition of

squint. He wishes the family physician to refer them early to the specialist. He refracts his cases and gives glasses early and if too young uses atropin in the good eye. If no improvement is noted after wearing glasses a few weeks he uses orthoptic exercises. If no result is then obtained he operates, —usually about the sixth year of age. **Stapleton** reviews strabismus for the general practitioner.

**Maddox**, in doing advancements, clips the tendon stump at its insertion with the scissors, and then rapidly cauterizes it, not letting the heat penetrate the globe. He believes that by this the new attachment is firmer and better fixed at the site of the old insertion. He advocates surface cauterization in tucking operations also; in place of scraping the tendon.

**O'Connor** reviews briefly his shortening operation (Y. B. v. 11, pp. 78, 80; v. 12, p. 69) and tabulates the results of some forty operations. One of the claimed advantages is that it may be employed at any age. The operation is still in its developmental stage. He uses no binocular and occasionally no monocular bandage. **Larsen** writes on Operation for Convergent Strabismus.

**Hulen** believes lenses should be prescribed in squint as early as six months, and that by the age of four all non-operative measures shall have been tried, and operation is then indicated if the squint persists. He disagrees with Reber who says 14-16 years is the ideal age. Tenotomies are inadvisable as are all operations which involve the cutting of the tendon from its attachment. He then describes his method offered in 1910 (Y. B. v. 8, p. 74). A general anaesthetic is used in children. One of the advantages claimed for the method is the employment of traction sutures which are left in until the following day at least; then, if overcorrection has taken place, the tight sutures may be removed and the traction sutures tied to hold the correct position.

**Briggs** presents again his operation for tendon shortening first described before the A. M. A. in 1909 (Y. B. v. 6, p. 105), employing the silver link to clamp the folded tendon. He has now

done 131 such operations with failure in but three. In one of these the link was lost, in the second it was imperfect and failed to hold, and in the third the clamp forceps was defective. The results of the method itself may therefore be placed at 100 per cent. In some cases where secondary advancements were necessary it was found always that the tendon had adhered to the sclera just back of the original insertion.

Will Walter, opening the discussion, approves of any method which does away with the unsurgical procedure of sutures under tension, and recites the fact that the O'Connor loop operation, the tendon tucking methods and immobilization by bandaging all tend to lessen this tension. He briefly outlines his method of accomplishing this by twisting the two portions of the split tendon over gold tubes. The tubes are twisted in opposite directions and held together by a gold pin and all buried under the conjunctiva and left a long time. There are no sutures employed in this. He thinks the silver links of Briggs may be better than his gold tubes, but the principle of splitting the tendon and burying the links seems better, since they may be left indefinitely and, moreover, by this method, tilting of the meridians could be corrected.

Jervey has found Briggs' method safe, simple and easy. "Any deviation, no matter how great, can be corrected by it without injuring a tendon." Wells thinks details are so lacking in the report of 131 cases that judgment cannot be made. Todd has tried the operation on three cases and reports 100 per cent failure and fears it is a matter of his own technic. Macleish has done the operation with gratifying results. He found difficulty with the forceps and has had one made of his own design. Moore thinks there should be some way of measuring the mm. of tendon shortened, and makes a suggestion of a method. Briggs called attention to the fact that his forceps carry a marked scale for the purpose of measuring. He claims that his operation is suitable for any case where shortening is indicated and that the links now have burs on

them which prevent slipping. Briggs demonstrated this method of shortening at a clinic before the Eye Section of the Southern Medical Association.

Wootton finds that paralytic strabismus is rare in children. Convergent strabismus is much more common than divergent. Any operation should be designed to strengthen the muscles believed to be weakened by disease. In myopia with weak converging power, advancements of both interni are proper and usually give excellent results. In hypermetropia with divergence excess free tenotomies of the externi, repeated if necessary, are successful. In the first class of cases tenotomies of the externi, and in the second class advancement of the interni, would always result in failure. Cases of anisometropia cannot be prognosticated as well as the above. In the latter cases the muscular error should be attacked. Mason writes on Treatment of Concomitant Squint. Bielschowsky has reviewed some of the results of war wounds upon ocular movements. They are indirect results of fragments of bone, cicatrices, adhesions and traumatisms generally and have not great significance except as medical war records.

Woodruff defines transplantation of tendons of the eye muscles as "transference of all or a part of a tendon from its normal insertion to a new one, in such a way that its physiologic function will be changed." The author has transplanted the outer halves of the superior and inferior recti to the sites of the externus in two cases of abducens paralysis, one of 20 and the other of 7 years of age. He exposed all of the muscle insertions, split the vertical recti backward about 12 mm. and sutured the outer bands to the insertion site of the paralyzed muscle, employing 00 catgut (treated with formaldehyde). Both eyes were bandaged three days, the operated eye seven days. In the first case examination showed improvement, but still some strabismus. Section of the remaining bands of the vertical recti for relief of the remnant of strabismus was of no avail. The cosmetic effect of the operation was better



in the second case. Both cases had amblyopia in one eye so that diplopia did not have to be considered.

Todd showed cinematographs of a case upon whom the operation was done, an extreme convergence, obscuring vision. The external rectus was absent. The result was much diminished convergence affording some motion and a degree of useful vision. A second picture demonstrated the value of advancement of the capsule in cases where the tendon attachment cannot be found.

Tenner has done the operation described by Woodruff upon a congenital abducens paralysis case, except that the internus was not tenotomized. The abnormal tendon strips were attached further than Woodruff has done. Severe reaction followed and some sloughing. Wiener has done the operation experimentally upon dogs and upon one case in man (external rectus paralysis), resulting in 20 to 30 degrees of power. Woodruff, in closing, would object to Tenner's advancement further forward and nonsection of the opposing muscle because of the tension upon the suture which must be minimized; and this is done by the method he has reported.

**NYSTAGMUS.**—**Lutz** briefly reviews the subject of nystagmus particularly unilateral, presenting a case of his own and appending two similar cases previously recorded. He disagrees with Arlt's opinion that the nystagmus would produce an enhancement of the peripheric images. Neither does he believe that in his case the movement is an intentional corrective movement as mentioned by Beard in his *Ophthalmic Semiology and Diagnosis*. **Dorff** reports two cases showing nystagmus when one eye is covered or the use of both eyes prevented, called by Fromaget "Latent Nystagmus." Refractive errors and heterotropia, usually convergent strabismus, accompany the phenomenon. Treatment consists of correction of the error of refraction and training of fusion if this is lacking. Operation for the squint is of cosmetic value only. **Gradenigo** writes of alternating monocular nystagmus.

**Yawger** rarely finds combined nystagmus of head and eyes, persisting during life and reappearing in consecutive generations. He presents an interesting history of such a condition in a Russian Jewish family, covering at least four generations and involving twenty-four people, not all of whom were affected. The characteristics of the nystagmus are noted but no record of visual acuity is given for any of the subjects since they objected to ophthalmic studies and Bárány tests.

**Ohm** has made a further contribution to miners' nystagmus. **Gowland** has written on voluntary nystagmus, and **Fromaget** wants to assign the name "latent nystagmus" to a variety, thus creating an analogy with latent strabismus. Six cases are cited in each of whom the nystagmus becomes manifest upon certain movements only. **Rochat** discusses the rapid phase of spontaneous nystagmus.

### CASE REPORTS

**Report I.**—**Linnell** believes that the influence of fusion upon muscular imbalance and asthenopia is not receiving enough attention. He uses training of fusion if other methods of relieving asthenopia fail, or at once if there is suppression of vision in one eye. The case of a neurotic girl is presented. She had been under treatment for two years by an oculist and showed an esophoria of 5 degrees at five meters. Refraction correction was unavailing. There was no binocular vision for near. For home use a stereoscope and series "A" of Dr. Wells' was given, and taper exercise for the interni. In two weeks she was able to read twenty minutes without fatigue and free from most of the symptoms, and was able to fuse all except three of the stereoscopic cards. She was later discharged with instruction to continue bar-reading an hour each day.

**Report II.**—**Stilwill** presents an interesting case of exophoria of twelve degrees, resulting from four to five operations by different operators, originally undertaken to cure an esophoria of twenty degrees. Both eyes have been operated and the patient has crossed

diplopia and nystagmus, and complains of headache and occipital fullness. The most annoying symptom is vertigo when fixing for distance. To get relief he wished enucleation of his right eye. Interesting features of like cases were brought up in discussion.

Report III.—**Bane** showed a patient, female, aged 21, with history of convergence of right eye since four years old. Before operation she had sixty centrad of convergence. Advancement operation, severance of the internal rectus and severance and advancement of the external rectus was done with satisfactory result.

Report IV.—**White** presented a woman in whom a well marked divergent squint with a marked upshoot of the right eye had been relieved by a tenotomy of the right inferior oblique and of both externi. The result, both cosmetic and subjective was remarkably good.

Report V.—**Jackson** presented a man, aged 21, who, two years ago, showed thirty-five centrad of divergence developed during the preceding five years. After a tenotomy of the right external rectus combined with an advancement of the right internal rectus, twenty-five centrad of divergence remained. Then an extended tenotomy of the left external rectus was done and the globe held in for thirty hours. There remain only four degrees of exophoria.

Report VI.—**Todd** presents a case of congenital insufficiency of the left superior rectus, with secondary deviation upward of the right eye caused by compensatory overaction of the inferior oblique, accompanied by head tilting. The case is illustrated with moving pictures. Under general anesthesia he did a complete myotomy of the right inferior oblique and two weeks later under local anesthesia the superior rectus of the left eye was shortened by tucking. The result was very gratifying, the tilting disappearing and parallelism obtained. Double vision did not return. Duane is freely quoted. Todd and Reber both believe these cases are more numerous than generally supposed.

#### NEUROLOGIC

Report VII.—**Santos Fernandez** reports seventy cases of paralysis of cranial nerves.

Report VIII.—**Crisp** reported a case of abducens paralysis in a man of thirty-seven years. "The fundus and vision being normal, and the only other symptom an aching of the back and left side of the neck. There was a history of a primary sore four years previously, and of treatment with one dose of salvarsan and subsequent inunctions. The Wassermann test had been negative on several occasions. During the two weeks since the first visit, the patient had been under mercurial injections intramuscularly, and there had probably been a slight improvement in the motility of the left eye. The patient's muscular reflexes and coordination were normal."

Report IX.—**Jackson** presents a man of 51 showing a convergence of sixty centrad in the right eye, with inability to bring the eye within fifteen or twenty degrees of the median line. Trouble followed an injury low down on the forehead a year before. Diplopia requires the constant covering of this eye. The use of slips from the superior and inferior tendons to attach to the external tendon was mentioned dubiously. The consensus of discussion on this case was that operation would not be successful. Covering the eye by a patch or obscuring vision by strong plus sphere was advised.

Report X.—**Leavitt** reports a case of recurrent paralysis of the right abducens nerve in a young woman of 23 years whose first attack occurred at the age of 1½ years accompanying measles. The attacks have occurred at intervals from a few days to thirteen months and are ushered in by severe headaches, chills and fever; sometimes nausea and vomiting. Whilst recovering a sensation of pressure is experienced in the paralyzed eye. In discussion the theories of recurrent abducens paralysis are brought out.

Report XI.—**Salomonson** reports bilateral ocular paralysis.



Report XII.—**Yzerman** records paralysis of right externus with otitis and mastoiditis.

Report XIII.—**White** presents a boy with a complete congenital paralysis of the left superior rectus for which he had done a tenotomy of the right inferior oblique. A partial success only had been obtained, showing the limitations of the tenotomy. The deviation was reduced from 37 to 27 degrees, the marked upshoot of the right eye was almost abolished, but there was still some head tilting. It was proposed to obtain further correction by advancement of the left superior rectus. Dr. Duane remarked that the results of tenotomies in these cases varied greatly, and in a similar case a tenotomy had produced all the result that could be desired.

Report XIV.—**Grossman** presents ophthalmoplegia interna in a syphilitic family, consisting of the parents and four children all of whom present typical symptoms. All were put on anti-syphilitic treatment, some showing slight improvement, some continuing unfavorably. A short paper with some review of the literature accompanies the presentation of the cases.

Report XV.—**Moore** recites the case of a girl of 4½ years who suddenly developed ptosis a few weeks after an attack of measles followed by bronchopneumonia. There was also paralysis of the sphincter of the iris. Temperature was 102 degrees on the evening of admission to the hospital. Slight slurring of speech was noted. The fourth and sixth nerves were unimpaired. Ophthalmoscopic examination showed a thin choroid with a few isolated patches of choroiditis. Temperature gradually became subnormal and the lung condition grew worse. Diagnosis of tuberculosis was made and ten days after admission to the hospital the girl died of tubercular meningitis. Autopsy showed no involvement of the nucleus or of the intracranial course of either third nerve.

Report XVI.—**Castex** reports rare ophthalmoplegia of central origin.

Report XVII.—**Ishida** presents a typical case of Bell's phenomenon, in a man with ectropion due to a hot water burn. There was no disturbance of ocular movements, except rotation of the eyeball downward upon closure of the lids. A similar case following a Pagenstecher operation for ptosis is cited.

Report XVIII.—**Finlay** presents a case of paralysis of the superior oblique, following ethmoiditis.

Report XIX.—**Tuto** reports injury and paralysis of an externus.

Report XX.—**De Schweinitz** and **Spiller** present a case of complete external ophthalmoplegia immediately following a severe attack of coughing. The patient was a girl of four years. Neither eye could move up or down but there was rotation of one millimeter downward. The ciliary muscle was normal. Under KI, gradual improvement to normal took place, an intervening diphtheria being treated with antitoxin. Hemorrhage in the corpora quadrigemina with a lesion of the oculomotor nuclei is considered. An interesting feature is that the lesion was bilateral.

Report XXI.—**Verderame** has seen a sixteen-year-old boy in whom the head had a tendency to turn to the left side. The right eye was normal in all respects, but the left showed a convergent strabismus of 28 degrees with a slightly narrowed palpebral fissure. All movements of this eye up, down and inward were normal, but outward movement stopped at the median line with slight downward and inward rotation and slight elevation of the upper lid. Pupils were equal and reactions normal. Double vision could not be elicited. This case was operated by Gonin's advancement, the external rectus of the left eye being split backward, the posterior end of the split portion being tied to the tendon stump and the two anterior ends sutured high and low to the limbus. The final result showed strabismus of four degrees. The literature is reviewed.

Report XXII.—**Mardellis** cites an unusual case of abducens paralysis in a man of 40 years; following violent

traumatism of the left mastoid, orbit and jaw bone accompanied by evidence of deep injury, nasal and aural hemorrhage. Nothing remained of the injury but the abducens paralysis.

Report XXIII.—**Emmert's** case of amaurotic ophthalmoplegia occurred in a woman of 60 years who complained of an itching in the left eye and dimness of vision lasting six months. Vision was  $2\frac{1}{2}$  per cent with slight swelling of disc and arteries somewhat narrowed. When seen five months later she showed total paralysis of left eye, except the superior oblique, complete ptosis, bare light perception and slight bulging of the globe. The fundus showed; atrophy on the inner side, slight swelling of the disc, and some obscuration with veins bulging. Roentgen ray showed no tumor. Wasserman negative. General health good. About one year later this eye was enucleated. Nothing was found in the orbit and nothing abnormal in the eye. Except for the ptosis the patient is now perfectly normal. Emmert makes no diagnosis, but locates a probable causative lesion somewhere between the optic chiasm and the orbit.

Report XXIV.—**Zentmayer** gives the history of a girl of 5 years who shows complete paralysis of the left external rectus. All movements except inward are normal. No retraction in adversion. Fundus normal, H. 5. D. The squint was noticed immediately after birth, and the child's mother shows a complete paralysis of the left external rectus, with other movements and fundus normal. O.D.—2.00 D.; O.S.—4.00 D. Her squint also was noticed immediately after birth. The child's grandmother, aged 61, showed upon examination exactly the same muscular condition as existed in the mother and child, O.D.—12.00 D.; O.S.—3.00 D. The grandmother was one of seven children; she alone being affected. She is also the mother of three children only one of whom was affected. The patient presented is an only child.

#### NYSTAGMUS

Report XXV.—**Witmer** cites the record of a young man of nineteen who

has always had divergent squint in the left eye. Vision was good until four years ago, when, following a fever, it became impaired and nystagmus appeared. Upon looking to the right the eye goes down and is retracted about three millimeters, and nystagmus is manifest in both eyes. A tenotomy of the external rectus shows this muscle to be a tendinous inelastic band, and an advancement of the internal rectus shows this muscle to be an elastic band with some muscle tissue, though with doubtful contractility. The etiology of this condition is shown by the writer and the literature reviewed.

Report XXVI.—**Boyd** presents a patient who formerly had a paresis of the superior rectus muscle of one eye and now has a rotary nystagmus of both eyes, with the quick component directed to the left.

Report XXVII.—**Lutz** reports a case of unilateral vertical nystagmus in a woman of 39 years. This began at the age of thirteen when brick dust entered her left eye. On removal of the bandage she saw all objects dancing before the left eye, and this has continued ever since. The motion is unilateral, vertical, pendulum like, more pronounced in the primary than in the terminal position, is 2-3 mm. in extent and 2-3 per second. In early childhood she suffered from an inflammation of the optic nerves, and the accident later coming in an already predisposed eye is thought to have produced the nystagmus.

Report XXVIII.—**MacKenzie** presents a long, classical paper on "after-turning" nystagmus, covering his investigation of eight years; and his findings are contradictory to those of Bárány. He gives the results of his examinations in one hundred and seventeen cases, all of which are appended separately. While giving all due credit to Bárány, he believes the latter's technique faulty. His differences consist: (1) in the length of time of the average and maximum durations of horizontal after-nystagmus; (2) in seeing no case with absence of nystagmus; (3) more consistent results in reexaminations;



(4) less variation after rapid and slow turnings; (5) in finding results more reliable after twenty turns than after ten turns; (6) more nystagmus after twenty turns than after five turns instead of an equal amount; (7) he has never seen a case of "after-after-nystag-

mus" and does not believe it exists. His dancer case supported the claims of Bárány as regards turning dancers. The paper is a valuable contribution to the subject and should be read in the original, as it does not lend itself to abstracting.

## THE CONJUNCTIVA

WM. ZENTMAYER, M. D.,

PHILADELPHIA.

This section reviews the literature relating to the conjunctiva and its diseases appearing during 1917 up to November 30.

**DIAGNOSIS AND DISTRIBUTION OF CONJUNCTIVITIS.**—A timely editorial on the importance of a careful differential diagnosis in cases of supposed conjunctivitis appears in the *New York Medical Journal* (v. 105, p. 367). **Elliot** saw, in the Government Hospital at Madras, from 30 to 50 or more cases of catarrhal ophthalmia in a single morning, and as similar conditions exist throughout India he points out how difficult it is to form a true conception of the enormous mass of conjunctival disease prevalent. The treatment of these cases is largely in lay hands. The common ingredients used are the juice of the leaves of the tamarind tree, the juice of fresh limes, alum, various kinds of peppers, iron filings, human milk, human urine, cow dung, ghee (clarified butter) and a great variety of other substances. The results are disastrous. Granular ophthalmia takes an appalling toll of human sight in India. As the result of his enormous experience **Elliot** states deliberately that this disease should never be permitted to cause the slightest diminution in visual acuity if treated from the first.

**Eason**, in his report of the ophthalmic cases seen in Cairo and Alexandria in the first six months of 1916, states that conjunctivitis has regularly caused about 10 per cent of the ophthalmic cases in the British hospitals. The two main varieties were the K.-W. and the

M.-A. The clinical aspect of the cases presented nothing unusual except for the occasional severity of a K.-W. infection. Recent cases of trachoma were rare and sporadic, which contrasted with the universality of trachoma infection among the natives of Egypt, speaks volumes for the personal cleanliness and sanitary arrangements. **Gibson**, in his report on the Ophthalmic Hospital at Lemnos, speaks of foreign bodies in the conjunctiva, pterygium, conjunctivitis—catarrhal, phlyctenular and traumatic, as occurring amongst the troops.

**OPHTHALMIA NEONATORUM.**—From the final report of the Royal Commission on venereal diseases of the United Kingdom (*Brit. Jour. of Ophth.*, v. 1. p. 390), and from the appendix and the discussion which followed its presentation, the following abstracts are of interest. Regarding the value of notification in ophthalmia neonatorum, **Cross** thought that it already had accomplished something and believed that through this measure it would ultimately be stamped out. **Jessop** approved of notification, but did not think it helped much to reduce the number of cases. **Harman** was of the opinion that it served two useful purposes; first, it made medical men and midwives more careful; and, second, it rendered speedy treatment of the cases much more likely to be secured. **Newsholme** laid down as a principle that "the advisabil-

ity of notification in any disease is conditioned on its associated circumstances." Gregory stated that since notification by midwives had been enforced there were fewer cases. Chalmers has found that there is a certain family predisposition to the disease which suggested the advisability of treating the mothers for the underlying complaint, and it has been found the worst results occurred in cases complicated by congenital syphilis. **Figueras Parés** has written a general article on gonococcus ophthalmia in the newborn.

**OPHTHALMIA NEONATORUM OF NON-GONOCOCCAL ORIGIN.**—**Thompson** emphasizes the importance of the dissemination of the fact, that quite a large percentage of cases of ophthalmia neonatorum are of nongonococcal origin. He considers it quite safe to look upon as gonococcal, all acute blennorrhoeas in infants five or six days old, when the flow of pus is excessive and the lids greatly swollen. He states that he has never cured a case of this kind in less than three weeks and accepts the view of Roemer that it is a selflimited disease.

**TREATMENT OF OPHTHALMIA NEONATORUM.**—The following account of the method of preparation of Nicolle and Blaziot's vaccine which **Delorme** says that he used successfully in the treatment of ophthalmia neonatorum is given. (See Y. B. v. 13, p. 94.) These investigators found that another coccus beside the gonococcus was present in gonococcal ophthalmia; to this they give the name of synococcus. The vaccine is made as follows: A pure coccus, which has been induced to grow on a medium relatively poor in serum, and also a synococcus are inoculated on separate tubes of a medium consisting of meat broth 100, urea 0.4, glucose 2, phosphate of ammonia 0.05, sea salt 1, agar 1.5, to which is added in the tubes 0.5 c.c. of rabbits' serum to each 5 c.c. The synococcus tube receives no serum. The cultures are removed from the incubator after 24 hours, emulsified in 0.7 per cent solution of fluorid of sodium, washed and centrifuged.

The vaccine is made of nine parts of

synococcal culture to one of gonococcal, and triturated to contain 500 million microbes per c.c. The vaccine is kept for 48 hours in the ice chest to destroy the vitality of the organism. The dose is 0.5 c.c. diluted with 1 c.c. of normal salt solution and is given intramuscularly.

**Stein**, from an experience of four years in its use, believes sophol "four times as efficient as a prophylactic as compared with nitrat of silver." To obtain this efficiency a proper technic in its employment is necessary. Two persons are required, one to pry apart the lids using small pledgets of gauze or cotton, the other to administer the drug. One drop of a 5 per cent solution is instilled directly into the eye and a second drop placed at the inner canthus when the lids are closed. The latter is to insure disinfection of the lid margins.

**PNEUMOCOCCAL CONJUNCTIVITIS.**—**Brownfield's** patient was a Mexican boy 12 years of age. Both eyes were affected. The lids were so swollen that the cornea could not be examined. The entire conjunctiva was coated with a white fibrinous exudate. There was very little pus. The cervical glands were swollen. Cultures from the eyes and throat were negative for Klebs-Loeffler bacilli, but showed pure cultures of pneumococcus. The temperature was 102.6 degrees. Despite appropriate treatment, including ethylhydrocuprein and pneumococcus vaccine, symptoms of meningitis developed on the 13th day, and death resulted on the 18th day. No autopsy was obtained.

**Clapp** reports a case, which is of interest because of the chronic nature of the disease, and the death of the patient. The conjunctivitis had persisted for 18 months, during which time no definite organisms were discoverable. However, during a recurrence three and one-half years later pneumococci were found in a smear and culture. Following treatment with vaccines, which resulted in a great improvement in the conjunctival condition, the patient developed a fatal attack of pneumonia.

(Continued next month)



# DIGEST OF THE LITERATURE.

## THE CONJUNCTIVA.

WM. ZENTMAYER, M. D.

PHILADELPHIA.

(Continued from February issue)

Gill reports an epidemic of pneumococcic conjunctivitis occurring in Buenos Aires during August and September, early spring. Sixteen cases are included, the patients ranging in age from 13 to 40 years. The treatment consisted mostly of applications of silver nitrat and formaldehyde solution. All recovered promptly.

**DIPHTHERITIC CONJUNCTIVITIS FOLLOWING SQUINT OPERATION.**—Taylor saw diphtheritic membranous conjunctivitis develop in an eye two days after an advancement operation with tenotomy. The patient, who was a girl of 11 years, had diphtheria a few months before, and there was a baby in the house who was a diphtheria bacillus carrier. Recovery took place under antitoxin, and quinin lotion, but not before the external rectus had sloughed.

**SQUIRREL PLAGUE CONJUNCTIVITIS.**—A case of this affection is described by Lamb. (See Y. B. v. 11, p. 128.) The patient was a colored girl. Two days previous to the onset of the conjunctivitis the patient had prepared rabbit for the table. Guinea pigs inoculated with the secretion from the affected eye died on the fourth day; and the bacillus tularensis was isolated from numerous miliary abscesses in the liver and spleen. The case was treated locally with boric lotion and cold compresses. An autogenous vaccine was administered and seemed to do much good. Recovery was complete by the end of the fourth week.

**INFECTION OF CONJUNCTIVA FROM CATS.**—Lawson records three cases in which intense conjunctival conditions were traceable to infection from the fur of cats. All occurred in children of well-to-do parents, whose homes were of the cleanest and best. In one case

the organism found was the staphylococcus pyogenes aureus. In the second, the condition resembled tuberculosis of the conjunctiva. The organism common to the secretion and the skin of the child's pet cat was a streptococcus. In the third case there was a tuberculous conjunctivitis and adenitis. Abundant tubercle bacilli, of the bovine type, were recovered from both sources. No opportunity was afforded for bacteriologic examination of the cat.

**OPHTHALMOMYIASIS.**—Maggiore records having seen this rare affection in a child of eight months. The superior quadrant of the bulbar conjunctiva was covered with large veins separated from one another and located in both the conjunctiva and episcleral tissue. The conjunctiva appeared raised and transparent as from edema. In the upper part, adherent to the sclera, there was a thread-like structure 3 m.m. in diameter and 1 c.m. long, shaped like a cigar and somewhat arched as though to correspond with the margin of the cornea, from which it was separated 3 m.m. With the corneal microscope it was found to be a parasite. There was a transparent connective tissue sheet by which it was attached to the sclera. Grassi pronounced it to be the larva of a fly, but was unable to decide the precise variety. There was no history of a sting and no inflammatory symptoms as in other reported cases.

**STREPTOTHRIX OF THE CONJUNCTIVA.** Pereyra describes what he considers to be a unique case of nodular affection of the conjunctiva due to streptothrix. The patient was a nine-months-old child whose father had suffered from trachoma and in whose family history there was a suggestion of tuberculosis. A month before the onset of the ocular condition the child had suffered some

throat affection for which antidiphtheritic serum was given. The author's summary as to this condition is as follows: There exists an ocular disease (streptothricosis) of the conjunctiva, characterized by the presence in the palpebral conjunctiva of nodular formations of two types. The more voluminous are pedunculated but not ulcerated, and have a smooth surface of red color with small yellow spots. Others are formed by the grouping together of small nodules of a grayish color, the size of a pin-head. The pathogenic agent is the streptothrix similar to the streptothrix violacea. The granuloma due to the streptothrix is composed of numerous giant cells, scattered in a tissue made up of epithelioid, lymphoid and polynuclear cells. Filamentary elements with ramifications are present (streptothrix). Surgical removal is not sufficient. Iodin internally and locally are required.

In **May's** case the conjunctiva alone was affected. The condition had persisted about one year. The conjunctiva of the lower lid of the left eye was markedly reddened and swollen, granular in appearance, and covered over in a portion of its extent by a thin yellowish white membrane which was firmly adherent to the underlying parts. The bulbar conjunctiva of the lower part of the globe was somewhat reddened and thickened, and presented a superficial ulcer covered by a thin membrane. Smears and cultures from the conjunctival secretion were negative, but from an excised piece cultures of streptothrix were obtained. Iodid of soda, salvarsan and locally iodine produced a slight improvement. **Sobhy** also reports a case of streptothrix infection of the conjunctiva in a young girl.

**CONJUNCTIVAL COCCIDIA.**—**Sakaguchi** finds the conjunctival coccidia to be widespread in Japan, so that the conjunctival hyperemia is frequently found among large groups of people. The coccidia have a small, round form and consist of three layers. There is a nucleus and a definite cycle of development.

**ATROPIN CONJUNCTIVITIS.**—During the employment of atropin locally, **Terson** saw develop a severe follicular conjunctivitis, covering completely the upper tarsus with granulations resembling a succulent trachoma. This subsided when euphthalmin was substituted.

**DIABETIC CONJUNCTIVITIS.**—**Hogg** reports a case of unilateral conjunctivitis in a woman 80 years of age with diabetes. It was intractable to local treatment, but yielded to diet and the administration of trypsin.

**INDUCED CONJUNCTIVITIS.**—**Cosse and Delord** describe their method for microscopic study in cases of suspected induced conjunctivitis. A pledget of cotton on a carrier is swept along the lower culdesac. The cotton is then placed on a slide with a drop of water and glycerin and examined under a cover-glass. This suffices for a gross examination. Or it may be stained with a iodine-iodid solution, which is excellent for staining the elements of powdered ipecac. For examining the powder found on the suspect, they first employ a solution of hypochlorit of soda in which the powder is placed for five minutes. After washing, it is stained with iodine for five minutes. The characteristics of powdered ipecac are found to be the same as described by **Kalt** (*Y. B. v. 13, p. 108*).

**Sblordone** has found that the ricinus seed is the substance preferred by the malingeringer, a small fragment being introduced into the inferior fornix. The symptoms produced are edema of the eye lids, abundant purulent secretion, swelling and thickening of the palpebral conjunctiva. At some points of the lower lid whitish eschars are seen. The bulbar conjunctiva is chemotic, forming a ring around the cornea, sprinkled with numerous reddish points. In very advanced stages the upper portion of the conjunctival sac participates. The cornea remains unaffected. The subjective symptoms are slight.

**Condorelli Francaviglia** made experiments with the bean of the castor-oil plant. He has been able to produce a conjunctivitis by the use of different parts of the bean. In his experiments



he employed the whole bean; the bean freed of its covering or skin, and collyria made from pulverized seeds. He came to the conclusion that the bean was a topical irritant to the conjunctiva, producing a mucopurulent conjunctivitis which differed from ordinary conjunctivitis of bacterial origin in its unequal distribution. The inferior palpebral conjunctiva and the corresponding portion of the culdesac are intensely inflamed, while the bulbar portion participates moderately. In several cases there was marked edema. The congestion was of a flesh color, in contradistinction to the scarlet red of genuine conjunctivitis. Palpebral edema, more or less according to the inflammatory process, was present. Induced conjunctivitis is always monocular. The paste derived from the skin-freed bean excites a more prompt and energetic reaction than does the whole bean, or the collyria. For speedy preparation it is generally more convenient to use the pith, which can be easily done by the use of a spatula knife blade, and this will exclude the possibility of acute gastroenteritis by the handling of the castor oil beans and the transference of the substance to the mouth.

**Schevensteen** described the more frequently selfinduced ocular diseases met with in the Belgian army. He refers to two types, namely; where the provocative agent is ipecacuanha powder, and where the agent cannot be exactly identified. In the former the symptoms are due to the action of the emetin. This produces two forms of conjunctivitis according to whether the powder is introduced once or repeatedly; that is, it causes either acute or a chronic conjunctivitis. He found conjunctivitis produced by such irritants as soap, tobacco, snuff, pepper and dental tartar scraped from the teeth. **Tristaino** has written a general review of the subject of provoked conjunctivitis.

**Bollack** states as an axiom that: given certain conditions under which conjunctivitis appears, a particular location and form of secretion rebellious to proper treatment, the possibility of artifacts must be entertained. A mi-

croscopic study is of utmost importance for the detection of foreign matter, absence of pathogenic organisms and the presence of polynuclear eosinophiles. The limitation of the disease to one eye is always suspicious.

**GAS INJURY TO THE CONJUNCTIVA.**—**Derby** describes the condition present in the eyes after exposure to the new German gas. First there is lacrimation and burning of the eye, coming on from three to four hours after the "gassing" occurred. This increases so that the patient is practically unable to open his eyes. In from 36 to 48 hours, or longer, the eyes can be opened and show signs of what is usually a mild burn, marked injection of the conjunctiva and usually a watery discharge, but some times a mucopurulent one. Always some ciliary injection is present and the corneal lesions vary from a roughening of the epithelium to the formation of a shallow ulcer.

**TETRYL CONJUNCTIVITIS** — **Smith** notes the occurrence of conjunctivitis, with or without dermatitis, among female workers in tetryl (tera-nitro-methyl-anilin).

**ELECTRIC OPHTHALMIA.**—**Moreau** records two cases of electric ophthalmia. The first patient, a man aged 35 years, had his eyes exposed at 6 P. M., without any protection, to the intermittent glare from electric welding for five minutes. During the following half hour he had yellow vision. But this passed off and he had no further trouble until 2 A. M. the following day, when there was swelling of the lids and redness of the conjunctiva, with considerable discharge and exfoliation of the epithelium over the lower part of the cornea. There were no pathogenic organisms. Under irrigations with artificial serum, the eyes became normal on the following day. The second patient was exposed to light from a short circuit; which immediately produced dazzling, redness and lacrimation in both eyes. There was no corneal lesion and the eyes became normal in 24 hours. The author believes fluorescein would frequently reveal corneal lesions in conjunctivitis from short circuit flames,

and in snow blindness. See also Injuries.

**VERNAL CONJUNCTIVITIS.**—**Botteri** observed seven cases in 577 patients seen between May and October. One case was unusual in that for 13 years the inflammation had been unilateral and accompanied by marked ptosis. Then the eye heretofore uninflamed showed conjunctivitis of typical vernal type. In another case the conjunctivitis was accompanied by summer catarrh and intense pigmentation of the bulbar conjunctiva. In two cases the condition accompanied an attack of mixed-infection-conjunctivitis. Three cases were of the pure bulbar type. All the patients were strong peasants and showed marked pigmentation.

**Allport** has employed X-rays in the treatment of vernal conjunctivitis in 15 cases, and in all an absolute cure was effected. **Pusey**, who treated the cases, considers radium as efficacious, much more convenient to use and safer. The cure is assisted in some cases by tooth brush brossage, with either boric acid powder or 1-1000 bichlorid solution. **Butler's** paper on the successful treatment of vernal conjunctivitis with radium was noticed last year. (*Y. B. v. 13. 297.*)

The treatment of spring catarrh by radium is discussed by **Butler**, who illustrates his method by the report of two cases. The exposures range from five minutes to fifteen minutes, being inversely as the quantity which was 45 milligrams to the former and 7 for the latter. They were repeated a few times daily and then at longer intervals. He quotes **Mackenzie Davidson** as stating: "In every case which I have treated with radium the plaques have completely disappeared, leaving no scars at all."

**Shine** treated a case of vernal conjunctivitis with radium to one eye, and astringent washes to the other. Three applications were made at two weeks interval, and a fourth, five months later. The dosage was 20 mg. of 2,000,000 activity applied from 25 to 35 minutes. One month after the last application the lid was smooth, secre-

tion much diminished and subjective symptoms greatly improved. The control eye was unchanged. He has treated four other cases with radium. Two were pronounced cured after two applications of 60 mg. for 15 minutes. One case required four applications. He has never observed complications.

**McDannald** saw a severe conjunctivitis, central keratitis and dermatitis follow a single application of radium administered for vernal conjunctivitis presumably due to faulty technic. May in discussion considered radium an effective agent for good in vernal conjunctivitis if administered in dosages of 25 mg. properly screened. **Matson** reports a case of the bulbar type in a boy 14 years of age in which the disease had its inception after an attack of measles.

**Griffith** reports a case in which after carbon-dioxid snow had failed, radium was applied with excellent results. The patient remained well for three years, then there was a slight return. After the application of radium the conjunctiva again assumed its normal appearance.

**McDannald** first saw this case nine years ago when it presented a granulomatous mass in the conjunctiva of the upper lid, the pathologic diagnosis of which was round-cell sarcoma. Nine years later both eyes presented the appearance of a mixed infection of trachoma and vernal conjunctivitis. There was dense pannus covering the upper half of each cornea. No eosinophiles were present. Despite drug and surgical treatment the condition grew worse. High frequency current was then applied once a week of one minute's duration for the first two weeks, and then once in three weeks for five months' time. The result has been almost complete recovery, the pannus having disappeared. The patient of **Bailey** had been seen the previous year by **Gradle** and **Suker** and diagnosed as plasma cellularis. Histologically the case proved to be an instance of clinically atypical vernal conjunctivitis. There was an eosinophilia of over 5%. The conjunctival secretion showed no organisms but an enormous number of



eosinophiles. Failure to make this examination when the case was first seen (Y. B. v. 13, p. 107), led to the mistaken diagnosis of plasma cellularis. Lane, who made the histologic examination, stated that the origin of plasma cells in the conjunctiva was still under discussion, they having been variously attributed to the connective tissue and to the endothelial cells.

**FOLLICULAR CONJUNCTIVITIS.**—**Kearney** holds that if the routine examination of the conjunctiva of school children's lids is carried out as it is at present, by public school nurses; we shall see little or no follicular conjunctivitis nor, possibly, trachoma, if these children are sent to us when the follicles show, and are ablated then or as soon as possible afterward.

**TRACHOMA.**—**Gowens'** article deals principally with the known pathologic features of trachoma. **Edmondson** thinks there is some ground for the belief that pannus is a protective measure for the purpose of preventing granulations from denuding the cornea and producing ulceration. He adds, however, that if this is the purpose, it fails in many instances. **Broyles** discusses the differential diagnosis of trachoma. **McMullen** says there is no disputing the fact that trachoma is communicable, and that it is decidedly on the increase and is widespread.

**Mestre Medina**, who has practiced for the last two years in Utiel and Requenna in Valencia, the elevation of which district is 800 metres, has been struck with the rarity of trachoma. He concludes as follows: 1. Trachoma is rare in Utiel and Requenna. 2. It presents itself for the most part in the form of large fleshy granulations. 3. The course and prognosis of the disease are less grave than usual, it being sufficiently docile to treatment, and this fact leads him to believe that this area may be considered an antitrachomatous one. 4. Contrasted with the scarcity of granular lids, there is a relative abundance of lacrimal affections, due to repeated nasal catarrhs.

**Wakisaka** examined all the inhabitants of a fishing village that has long been known as the stamping ground

of trachoma. He found that the disease was quantitatively and qualitatively worse among women than among men, and that the family transmission was carried more by women. **Watanabe** gives the trachoma statistics in Tokushewburake, an isolated village in the province of Yamagouchi.

**Zimmer** sees in the war a cause for the dissemination of trachoma. He found in the ten months' military service the disease in 27% of his cases and during his captivity in Germany he found that 50% of the Russian prisoners were afflicted. There can be no doubt as to the contagiousness of the trouble, contracted by the common use of linens and toilet articles. In the treatment he employed 10% copper sulphate in glycerin and noted rapid improvement.

**McMullen** tells of the methods in use to eradicate trachoma from Kentucky, Virginia, West Virginia and Tennessee. The service has a total of six hospitals with a bed capacity of 120. Six physicians with special training and a complement of trained nurses and attendants are on duty at all times. Each patient is instructed in the sanitation of the disease and the hospital corps do social service work. During the year ending June 30, 1916, 3,571 homes were visited and one district nurse rode over 4,000 miles during 10 months of this period.

**McMullen** says that the eyelids of all recruits and drafted men should always be everted, the examination to include the retrotarsal fold, and the condition of the membrane should be noted in a space on the blank form reserved for this purpose. If the conjunctival surface of the eyelids is not smooth and pink, if there is any redness or secretion, especially in the retrotarsal fold, such cases should be segregated for examination by those trained in the diagnosis of trachoma. An applicant who is found to be suffering from well marked trachoma should not be immediately rejected, but should be given treatment until the trachoma is cured. He can then be reexamined to determine whether he has sufficient visual acuity.

v. Hoor has found in Austria that a considerable number of trachoma patients in and near the age of liability to military service, were skillful in escaping all attempts at supervision and treatment. This practice was overcome by the military authorities, both in the interests of the army and of general prophylaxis, by refusing to accept trachoma as excluding the patient from military service, and also by placing all trachoma patients who were liable to military service in military institutions, under the care of special physicians, until they were completely cured, after which they were sent for military service or were dismissed, according to the age at which the cure was effected. The average length of treatment was four months, and about 80% of the patients were cured within the period of liability to military service. During the service age the trachoma patients were given regular military training at the garrison hospitals. Ferro has written on the prevention of transmissible conjunctivitis, especially trachoma, in Argentine.

Tenner thinks it would be desirable to exclude the victim of trachoma from the ranks; but in so doing the army would lose many men who in a short time, three to six months, could be cured and made safe as far as contagion is concerned. These excluded persons return to their homes, continue to live under unhygienic conditions and cannot be kept under supervision. Many work in factories where they disseminate trachoma. He quotes Austria as refusing trachoma as a cause for exemption. Wieden reports of trachoma involving the cornea. Gifford calls attention to the frequency of occlusion of the inner end of the canaliculus in old trachoma. Out of fifteen cases he found only one in which the patency of the inner end of the canaliculi was not occluded. Such a canaliculus is frequently a small pus pocket and plays an important rôle in the production of the recurrent keratitis which afflicts such patients. Occasionally the canaliculus is occluded at both ends, with a dilated pus-holding cavity between. In cases with these occlusions, they are

either overlooked or they are mistaken for dacryocystitis.

TREATMENT OF TRACHOMA.—Van Kirk has met with success in the treatment of trachoma both in the immediate effects and in the after results, and in both early and late stages of the disease. After anesthetizing the eye with holocain a paddle of wood is wrapped with sterile gauze which is soaked in bichlorid of mercury 1-500; with this the entire conjunctiva is thoroughly scoured. It is then flushed with the bichlorid solution. Rubbing is repeated every few days at first and at longer intervals as the case progresses. In the first few treatments rather free reaction results.

Friedländer made intragluteal injection of 10 c.c. of milk in 42 cases of trachoma, all of the severer type. The results were surprisingly good. The interval between the injections was never less than 48 hours. They were never repeated before the temperature had returned to normal. In some of the cases a long previous course of office treatment had given no relief but the earning capacity was restored after a single injection. Crawford reports on 21 cases of trachoma treated with Bulgarian bacillus culture. Three had received no treatment for about one year and none showed any tendency to relapse. Two other cases were treated only during the winter and an examination made during the following fall. The subjective symptoms were abated and there had been no progress in the condition. The treatment was supplemented by careful expression to aid the entrance of the bacillus into the diseased tissue. He does not claim it as a specific yet he believes the results compared favorably with the record of any specific.

Sculco has employed a pomade made of equal parts of pulverized nepetacitriodora mixed with glucosides and resins obtained from *Thymus serpyllus* and *Salvia officinalis*. This is applied to the everted lids and after a time washed off. There is marked reaction lasting two days, but after the fifth application this does not usually occur. The interval between the treatment



varies at from four to five days; later three to four days. He reports 10 cases. The results were in all remarkably good. Accompanying photos show results. He considers it a specific. Its advantages are the safety, the rapidity of the cure, its innocuousness and its ease of application.

**Carhart** believes the choice of remedies is not so important as thorough massage either direct or through the lids. His choice is a 5 per cent copper citrat ointment. When corneal complications have developed the Heisrath-Kuhnt operation is the only radical cure. **Rebay** has reviewed the present status of vaccine therapy for trachoma. **Kiribuchi** directs that the upper lid be everted and while it is being pressed against the supraorbital margin the patient is directed to look down. With the other hand the ball is pressed backward by a pressure made upon the lower lid. In this way the entire retrotarsal fold is exposed. With a proper instrument punctures are now made into the granulation and the infiltrated portions of the membrane. They are made down to the tarsus perpendicular to the surface. With a dossil of cotton saturated in bichlorid 1-20,000 the conjunctiva is pressed against the tarsus. After this the surface is rubbed with the sublimate solution. In this way the contents of the follicles are expressed. Following this airol is applied. Thereafter either daily or every other day friction and lavage with bichlorid or airol is employed. The advantages claimed are shortness of treatment required to secure a cure, usually one and one-half months; less trauma than by grattage or rolling, rapid cure of the secondary keratitis. **Simpson** considers light scarification, followed by either digital or instrumental expression as one of the most effective methods of treatment. **Richards** advocates grattage as the best surgical procedure.

**Suker's** indications for excision of the tarsus are: any case of trachoma which does not yield to the usual line of treatment; cases where the tarsus is intensely cicatrized and studded with vascularized pinhead nodes which

cause pannus; where the tarsus though comparatively smooth is greatly incurvated through cicatrization; when the conjunctiva is velvety and pannus is present; where the upper half of the cornea presents ulcers after an apparent disappearance of the trachoma; persistent pannus with the conjunctiva favorable for its continuance; cases in which grattage has left a distorted tarsus studded with vascular nodes. The following suggestions, if carried out, will lead to the best results:

Always leave 1. to 1½ m.m. strip of tarsus at the ciliary border. Begin the excision at the ciliary border of the lid; do not attempt to save conjunctiva directly over the tarsus; do not excise more than just the tarsus; dissect the conjunctiva far enough through the entire width of the lid into the retrotarsal fold, having just sufficient conjunctiva to cover comfortably, without too much tension, the area formerly occupied by the tarsus; do not excise the tarsus until the retrotarsal fold has been dissected; secure a good approximation of the edge of the conjunctiva to the tarsal strip left at the ciliary margin of the lid; employ a mattress suture to secure a requisite coaptation of the subconjunctival and subtarsal tissue; obliterate the "dead space" between the conjunctiva and the skin, by two properly placed sutures at a point corresponding to the previous retrotarsal border of the tarsus. This prevents retraction of the conjunctiva and prevents entropion as the anatomic insertion of the levator is thus properly maintained and ptosis does not follow it. General anesthesia is used.

**White and White** describe a method of doing canthoplasty with a special technic in cases due to trachoma. First an indelible line is drawn on the skin for the incision as a guide line. The incision is made a little above and extending from the external canthal commissure so that more of the superior fornix conjunctiva may be reached. The skin is held widely apart with the fingers and stretched toward the nose and then either with scissors or scalpel a horizontal incision is made through the skin and subtissues. The skin

edges are now undermined for some distance, especially at the conjunctival edges. For trachoma the operation proceeds as follows: First divide the canthal ligament. The skin flap is now folded on itself, that is, the skin surface is inverted and folded beneath the raw surface against the raw surface of the wound. A drawn whipped stitch is used, starting at the apex of the wound and extending to the center and then to the lower apex of the wound, passing the sutures through both folds of skin. Or a whipped running suture can be used in suturing the fold.

**Zentmayer** reports a case of trachoma in which a dense pannus in a short period of time almost entirely disappeared after the performance of the Kuhnt-Heisrath operation. In a second case of trachoma in which there was a threatened perforation of the cornea steady improvement followed this operation. The operation is considered applicable to all cases of trachoma except those in the beginning of the first stage and those at the end of the cicatricial stage.

**Dimitry**, in again urging the adoption of his method of mechanical manipulation of the tarsus in place of gramage, says that he cannot accept as a logical procedure the production of scar tissue to rid the conjunctiva of the follicles. The operation performed at the Government Trachoma Hospital is, according to McMullen, done with a specially devised forceps for everting the eyelid, two small scalpels, horn-spoon for protection of the cornea, Desmarres forceps, tooth-brush of medium stiffness, bichlorid of mercury solution 1-2000 and plain sterile gauze. The eyelid is thoroughly everted and the granules superficially incised and the thickened conjunctiva carefully scarified with the scalpels, care being exercised to include the cul-de-sacs. The surfaces are then gone over with the brush and bichlorid solution, followed by the thorough use of the gauze. Immediately following the operation the everted conjunctiva is washed with boric solution. The after treatment consists of cleansing the eyes carefully every three hours and in the use of a

20 per cent solution of aristol. After five or six days any uneven granulations or rough surfaces are lightly touched with a  $\frac{1}{2}$  per cent silver nitrat solution.

**White and White** describe an operation which they consider applicable to palpebral cicatricial cases where deeper tissues are involved, and to the "beef-steak" cicatricial type and to the smooth congested type of cases (chronic conjunctivitis). An incision is made through the palpebral conjunctiva from canthus to canthus a few millimeters from the margin. The conjunctiva is dissected from the tarsus up to the free border where the bulbar conjunctiva begins. Next the tarsus is dissected from the underlying tissue over the same area. The tarsus is then cut into numerous vertical strips by placing one blade of a small scissors beneath the tarsus and one blade on top. With the small roller forceps the strips are crushed; and following this the conjunctiva, or both, are rolled. The conjunctiva is sutured as in the combined excision and resection operation. It is claimed that this method leads in a short time to disappearance of the cartilage.

**PLASMOMAS OF THE CORNEA.**—In each of two cases described by **Marchi** there developed in an eye affected with trachoma a small tumor; in the central region of the cornea in the first case, and in the second case in the bulbar conjunctiva contiguous to the limbus and in the cornea. Clinically these tumors of the cornea were sharply limited, projected from the corneal plane for more than two millimeters, and presented a rosy, gray color, convex and irregular surface, and a fleshy consistency. They were thus easily to be confused with sarcomata of the cornea. Their occurrence in similar cases of more or less old trachoma, however, suggests with great probability that they represent an atypical trachomatous pannus; even though as in the first case reported, the tumor arose from the central region of the cornea without any connection with the corneal limbus or with the bulbar conjunctiva.



The histologic examination in both cases showed an identical structure. The principal mass of the tumor was composed exclusively of plasma cells, with abundant newformed blood vessels with extremely thin walls. The tumor rested upon the corneal parenchyma, of which it infiltrated merely the superficial layers; and was covered on the surface by an epithelium which gave origin to numerous prolongations which entered, especially in the first case, deeply into the principal mass of the tumor. The tumors, instead of being malignant, represented a chronic inflammatory process exactly corresponding in histologic structure to trachomatous corneal pannus. **Seo** saw a child who presented a condition of the conjunctiva of the lower lid in the form of a tumor accompanied by thickening of the tarsus. Histologically the new growth which caused the thickening consisted of plasma and lymphoid cells and some follicle formation.

**PARINAUD'S CONJUNCTIVITIS.**—In **Dutrow's** case, which occurred in a married woman 28 years of age who lived on a farm, cultures gave colonies elevated and with clean-cut edges; the center being a little darker and thicker than the periphery. The organisms were short rods arranged singly or in threads and stained rather slowly with alkaline methyl blue and were Gram positive. Unstained they showed marked Brownian movement. **Fernandez Castro** reports a case apparently tuberculous in character.

**TUBERCULOSIS OF CONJUNCTIVA.**—**Weeks** reports two cases. The first was in a girl nine years of age. The disease therein involved the upper palpebral conjunctiva and fold. There were enlarged follicles which showed little or no tendency to ulcerate. The lids were expressed without relief. The second case, in a child four years of age, was identical with the first. The preauricular glands were involved. Von Pirquet was doubtful in the first and positive in the second. No systemic involvement could be discovered. The infection was presumed to be due to slight injury to the conjunctiva. Some

improvement followed tuberculin treatment. Animal inoculation tests were positive. Microscopic study of removed tissue showed giant cells and caseous masses and one acid fast bacillus was found. Glands removed from the second case showed tuberculosis degeneration. **Patterson's** patient, who presented tuberculous ulcers on the palpebral conjunctiva of the right lid, was a woman 57 years of age. She had tuberculous infiltration of both lungs. In the sections of the affected conjunctiva removed from the case reported by **Coover** as Parinaud's conjunctivitis (Y. B. v. 13, p. 103) Finnoff found the tubercle bacillus.

In the case reported by **Shannon and Hughes** the conjunctiva and cornea were both affected. The patient was a negro aged 28 years. There was a family history of tuberculosis. Six years ago he noticed a papular elevation just below the nose which was followed by others in the vicinity. The condition was diagnosed as lupus vulgaris. The glands of the neck suppurated at this time. Three years later the condition appeared on the lower lid of the left eye. Four weeks subsequently slacked lime entered the eye and a few days later there appeared a small red mass beneath the upper lid. This increased in size to the dimension of a small walnut. It was polypoid and its surface granular. It was attached to the tarsal conjunctiva. The cornea became ulcerated and perforated from extension. Histologically the growth was a tuberculoma. The von Pirquet test was positive; the Wasserman negative.

**CONJUNCTIVITIS IN BACILLARY DYSENTERY.**—**Cosse and Delord** have met with conjunctivitis as a metastatic complication in bacillary dysentery. In some cases it was accompanied by affection of the joints while in others this was absent. In the first group the dysentery was, as a rule, more severe. The conjunctivitis and the arthritis usually came on about the fifteenth day of the disease. The former lasted from eight to ten days, while the latter persisted for several weeks. Both eyes were affected at the outset. The inflammatory signs were limited to the palpebral con-

conjunctiva especially of the lower lid. Secretion was scant. Smears and cultures were negative. In one case peripheral keratitis and iritis occurred as complications of conjunctivitis. In the second group the attack was very mild and affected almost wholly the conjunctiva of the lower lid. It appeared between the fifth and twelfth days of the bowel condition. They consider it a conjunctival condition of toxic origin, rather than an inflammation.

**Morax** saw one case in an epidemic affecting 250 men in the barracks. The conjunctival disturbance occurred at the end of the second week of the disease, and on the thirty-fifth day became complicated by a relapsing iritis in the right eye. He agrees with Feissinger and Leroy, who consider the articulo-ocular syndrome as analogous to the blennorrheic syndrome.

**ATROPHYING CONJUNCTIVITIS WITH SYMBLEPHARON.**—**Kuemmell**, after noting the various causes of symblepharon, describes the condition of the conjunctiva usually met with in old people who live in the country. The conjunctiva is usually thin and smooth, particularly on the lower lid. The upper lid is uninvolved. In the later stages the conjunctiva is smooth, of a pale pink color, occasionally white, giving the appearance of a faint pseudomembrane as after a mild cauterization. On the eyeball the conjunctiva is drawn into wrinkles. The conjunctival sac shows a varying degree of shrinkage. The semilunar fold and caruncle early suffer from general atrophy, the latter is often reduced to a small yellowish red dot. A characteristic symptom is the formation of an adhesion between the lid and the globe. It is symmetric in both eyes, particularly in the region of the lower lacrimal punctum. On everting the lid a sharply defined fold of conjunctiva will be seen extending to the eyeball from the lower lid. Such adhesions may be multiple. They are much less frequent in the upper lid.

**PEMPHIGUS.**—**Weidler's** case was in a woman 71 years of age. The palpebral conjunctiva of the lower lid and the corresponding part of the bulbar conjunctiva were injected. Cicatricial

bands were gradually decreasing the depth of the cul-de-sac. No blebs or ulcers were present in the eye, but they were found in the anterior part of both nares.

**ESSENTIAL SHRINKING OF THE CONJUNCTIVA.**—**Conlon** reports two cases. The first was in a woman 50 years of age. The disease began in the mouth and when seen for the ocular condition presented large bullae all over the body. The bulbar conjunctiva presented fresh bullae. There was beginning obliteration of the lower cul-de-sac notwithstanding that the eyes had been affected but one month. The second patient, also a woman 50 years of age, was first seen two years ago and then showed numerous vertical folds of conjunctiva in the shallowed lower cul-de-sac. At present there are erosions of the cornea and iritis. Within one month there was obliteration of the lower cul-de-sac. It is possible for the patient to open the eye two or three mm. He believes all cases of essential shrinking come within the classification of those of chronic pemphigus of the conjunctiva.

The two cases reported by **Hardy** and **Lamb** both occurred in young males. One was aged 17, a student in the school for the blind who had been vaccinated when seven months old. Pemphigus appeared two months later and both eyes became affected. One was rendered entirely blind, the other retained 1/36 vision. Wasserman negative. The other patient was a colored boy, aged 11, whose vision had been reduced to light perception. His trouble began when about one year old, ascribed to mosquito bite. A Wasserman was strongly positive. These authors have reviewed the literature bringing together a bibliography of 76 papers. **Cohen** also reports a case of essential shrinking of the conjunctiva in a woman aged 61, who had been affected for twenty months. Vision in one eye was still 20/30 and in the other 3/200. There was absence of vesicles or ulcerations on the conjunctiva, or of distinct evidence of skin pemphigus. Mouth and skin lesions present had



been diagnosed differently by different dermatologists.

**SYMBLEPHARON.**—In a case of complete symblepharon following enucleation for burn by a hot metal, Pratt employed a procedure which to him was new. It consisted in making a double row of holes in a large tin plate prosthesis and the suturing of a Thiersch graft to the plate. The sutures were removed after the sixth day. The graft lived but contracted to one-third of its original size. He proposes next to use the foreskin of a young child in place of the Thiersch graft. Zentmayer operated successfully by the Berens' method in a case of symblepharon where there was a rather broad adhesion between the lid and cornea at the position of an adherent leucoma.

**XEROSIS.**—Stilwill saw xerosis of the cornea and bulbar conjunctiva of one eye in a case of bilateral cicatricial trachoma.

**SUBCONJUNCTIVAL CYST.**—Stirling saw this unusual condition in a man 76 years of age. There was an oval semi-opaque swelling starting 2 mm. from the outer edge of the cornea opposite the palpebral fissure and extending out-

ward 5 mm., the vertical diameter being 3 mm. It was resilient with slight fluctuation and was fixed to the sclera. The conjunctiva was adherent to the apex but sloped away at its base. The cyst was perforated during its dissection, evacuating a clear fluid together with 7 small opaque bead-shaped bodies varying in size from a small pinhead to a split pea. The cyst was dissected out. The microscopic report by Oertel showed the cyst walls to consist almost entirely of well-formed large and medium-sized squamous epithelial cells with a good number of epithelial pearls. The cells rested in close proximity, forming thick layers, giving it an appearance of epidermis. He considers it to be of epidermal origin and that it owes its development to the proliferation of the lining squamous epithelium, central softening and cystic degeneration; with secondary papillary epithelial projection into the lumen of the mother cyst, thus giving rise to daughter cysts. Although there was no history of injury, Stirling believes it to have had its origin from implantation of a foreign body, though none was found.

## CORNEA AND SCLERA.

MEYER WIENER, M. D.

ST. LOUIS.

This section reviews the literature on diseases of the cornea and sclera for the year 1917.

### CORNEA.

**ANATOMY.**—Vital staining of the cornea was accomplished by Suganuma and Hoshiyama by intracorneal injections of lithium-carmin. Either preceding or following the staining, the cornea was cauterized with a zinc solution, the ciliary arteries were severed or Croton oil injected into the vitreous. The following spiculae were formed:

(a) Spiculae with eosinophilic granules (consisting of eosinophilic leucocytes that had forced their way in between the fibrillae).

(b) Spiculae with coarse carminophilic granules (consisting of Ranvier's plasmotocytes that had forced their way in between the fibrillae).

(c) Spiculae with delicate carminophilic granules (consisting of corneal bodies that had become mobile and forced their way in between the fibrillae).

Regeneration spiculae, with delicate carminophilic granules (consisting mostly of corneal bodies which usually were in direct protoplasmic connection with the undamaged mother cell).

The authors did not mention any-

thing decisive regarding the question whether or not there be so-called slumber cells within the cornea, which awake during an inflammatory process and take part in the formation of the spiculae, but they declined to doubt the truth of this theory.

**GROOVE KERATITIS.**—**Kuriyama** reports anatomic-pathologic findings in a case of chronic peripheral groove keratitis. There was observed in a 41-year old patient who died of acute gangrene of the skin, a progressive peripheral ulcer of the cornea in both eyes. Anatomically the floor was covered by a layer of epithelium, while the underlying parenchyma was composed of round, mast, and plasma cells. A great deal of fat was manifest by Sudan III stain.

**EPITHELIAL DYSTROPHY.**—An unusual form of epithelial dystrophy has been reported by **Posey** occurring in a young married woman, following an attack of ordinary conjunctivitis. There first appeared a faint stippling of the corneal epithelium followed by a dense white opacity, arch like in form and superficially vascular. This haze traveled slowly across the cornea. Posey explained the condition as one of corneal dystrophy, the most marked changes being located in the epithelium, the dense white area representing the hyalin product of the epithelial and subepithelial elements. The case seems to be similar to two cases by **Bordley** (see Y. B., V. 13, p. 119), which started at the corneal margin and gradually encroached toward the center of the cornea and then receded. No treatment seemed to have any effect.

**Weeks** reported an unusual case of epithelial proliferation of the cornea, elevated, circumscribed, elliptically shaped, 4 mm. by 8 mm., which had been twice removed and recurred. There was no inflammatory reaction, no injection of the cornea, and no bacteria were found in the scrapings, which consisted entirely of epithelial cells. The growth was of six months duration and perhaps analogous to the epithelial plaques.

**NEUROPATHIC KERATITIS.**—A case of calcareous deposits in the cornea is de-

scribed by **Gradle** in a man who had had repeated attacks of corneal ulceration during the past seven years, evidently of neuropathic origin. Both Wassermann and tuberculin reactions were negative. It had been suggested that in hyperparathyroidism, there being a deficiency of calcium in the circulating plasma, the patient be fed large quantities of parathyroid extract, trying to produce a deficiency of calcium, leading to absorption of calcium in the cornea.

Under the name of *Alphabet keratitis*, **Haab** describes a disease which seems to be analogous to the superficial linear keratitis described with much detail by **Spicer** and **Greeves** (Y. B., v. 12, p. 125). He lays emphasis on the importance of use of oblique illumination and the loupe, and recommends especially the Nernst lamp and Gullstrand apparatus. In the last eighteen years, Haab has seen only seven cases of this rare affection, which on good oblique illumination shows raised lines in the surface of the cornea, which cross and recross, giving the appearance of letters. The lines are straight and of different lengths. Haab treated one case successfully with Koch's old tuberculin but it is impossible to judge from one instance, that the disease has a tuberculous basis.

An unusually severe case of *herpes zoster ophthalmicus* was described by **Chance**, with dense opacity in the interstitial laminae of the cornea as made out with the loupe under oblique illumination.

Under the title of *dumbbell keratitis* an interesting series of three cases of corneal affection is reported by **Buxton**, which undoubtedly are closely related to the dendritic form of keratitis. The ulcer first made its appearance 2 mm. from the upper corneal margin. It was grayish white in appearance, with a comet like tail extending vertically downward, becoming markedly constricted as it left the head. The tail gradually extended downward until it reached a corresponding point near the lower corneal margin, when it expanded into another ulcer similar to the one above, giving the whole the



appearance of a dumbbell. There was little or no pain connected with the process and only slight pericorneal redness. The ulcer slowly disappeared without any physical cause having been found to account for it.

**BULLOUS KERATITIS.**—A case has been reported by **Campos**, four days after a burn of the second degree involving the thigh and foot, caused by an asphyxiating bomb. There were central opacities in both eyes, with more or less opacity in the periphery. In addition, there was a bulla in the center of the left cornea, formed of three pockets, which could be made to fuse into one by stroking with the upper lid. The tension was minus. Healing occurred rapidly while using an ointment of boric acid in lanolin. The patient never had any pain in his eyes, which Campos seemed to think showed that the pain in keratitis bullosa is not due to a stretching of the nerve filaments by displacement of the epithelium.

**CORNEAL ULCERS WITH ACUTE INFECTIONS.**—**Paul** describes the microscopic differences appearing in the cornea of the rabbit inoculated with the contents of a pustule of *vaccinia*, *varicella* and *variola*, after fixation in sublimat. He considers the reaction of great importance in police sanitation. Every time it occurs it is variola. It is not yet determined when it is positive, whether it is more or less virulent. **Perez Buñill** reports a case of destructive ulcer following smallpox.

**Wyler** saw a five year old girl affected with a mild case of *varicella* whose only symptoms were swollen closed lids, marginal crusts and extreme photophobia. In the center of the cornea was a punched out area 2 mm. in diameter, edges sharply marked, center deep and grayish. The ulcer showed no tendency to spread; within two weeks it was covered with epithelium. Six months later the vision was 6/36, whereas it had been normal before. Ten months later it was 6/24. The case corresponds to one described by **Terson** in a girl of eighteen.

Three cases of ocular *herpes* following *antityphoid vaccination* were reported by **Gloagen**, accompanied by fever, headache, and dorso-lumbar pain. Also cutaneous herpes. The corneal herpes was observed after the first injection in one case; after two injections in the second; and after the fourth injection in the third case. In each case remaining corneal opacities reduced the vision to 0., 0.2 and 0.6 respectively. A similar case in a soldier, aged 43 years, was reported by **Morax**, following the third injection; herpes of the lower lid appearing after the second.

**Woods** found, in experimenting on *trypanosome keratitis* in dogs that the keratitis bears a striking resemblance to that caused in man by the *treponema pallida*. The development of the symptoms appears in both with the appearance of trypanosomes and spirochetes. The lesions are readily cured by repeated injections of arsenobenzol. The experiments are corroborative of those made by other workers.

**MOOREN'S ULCER.**—Additions to the pathologic anatomy of rodent ulcer of the cornea are described by **Masuda**. In this unusual type of ulcer, the author found the following: The base of the ulcer was covered with a 7-10 cell deep layer of epithelium that at the edges curved over so that the floor of the ulcer was denuded of epithelium. There was some lymphocytic and plasma cell infiltration under the thickened epithelium of the floor as well as some polynuclear leucocytes and eosinophiles. The central abrupt edge, where Bowman's membrane and the epithelial layer were lacking, was likewise infiltrated, but especially at the apex of the curve where the peripheral portions joined the floor of the ulcer, was a dense cellular infiltration that could be followed deep into the corneal parenchyma. The rest of normal appearing cornea showed but slight cellular infiltration, and Descemet's membrane and the endothelium were intact. The author does not believe that this is an ectogenous process, but rather that it is due to endogenous bacillary toxemia, causing the corneal destruction. In proof of this, he mentions the fact

that both eyes are frequently attacked and that therapeutic measures aimed at local relief are without avail. **Shannon** demonstrated a case cured after five cauterizations.

#### PREVENTION OF CORNEAL INFECTIONS.

—A careful and systematically arranged article on the prevention of corneal infections is presented by **Oström**, who arrives at the following conclusions:

(1) Every injury of the cornea can be kept from becoming infected, and, if infected, the wound can be rendered sterile without material injury to the tissue beyond the original trauma, if seen soon after the injury. The treatment to depend on the bacterial findings, viz.: (a) Morax-Axenfeld diplobacillus—Zinc fluorescein, or zinc salts. (b) Pneumococcus—Optochin. (c) Streptococcus and Staphylococcus—Iodin or formalin (Chaufrage). (d) Gonococcus—Argyrol or silver nitrat (e) Diphtheria bacillus—Antitoxin.

(2) The eye will do just as well with, as without, a bandage after the removal of the foreign body, whether infected or sterile. The final result will depend on the treatment as outlined in 1.

(3) Spuds can be sterilized equally well, if properly done with phenol and alcohol, or by boiling long enough.

(4) Just as good results are obtained if the patient returns to work after the removal of the foreign body, as if he waits till the next day, if primary treatment is correct. The eye to be kept closed until the cocain anesthesia wears off, and the tears begin to flow.

(5) The ordinary first-aid man is to be condemned as dangerous in removing foreign bodies from the cornea. By careful training some can be made efficient, but most of them cannot.

The use of atropin, subconjunctival injections, application of heat and cold, and other self evident measures of symptomatic treatment is taken for granted in each case. This paper deals with the prevention of infection of the cornea—not the treatment or care of after results.

**DIPLOBACILLUS ULCER.**—**Scarlett** reports on 20 cases of corneal ulcer in which bacteriologic examination re-

vealed a diplobacillus. In 6 of these it was found to be the diplobacillus of Morax and Axenfeld, and in 13 the bacillus of Petit. In one case the organism was what he calls *bacillus duplex nonliquefaciens*. The latter organism he thinks distinct from the others, because it will grow in gelatin without liquefaction, causes no erosion or liquefaction on coagulated serum, and when inoculated into rabbits will produce a serum containing specific agglutins and precipitins. He notes that marginal ulcers contained only the M.-A. bacillus, which was also found in the conjunctiva. These were never accompanied by hypopyon and healed quickly. Central ulcers contained the bacillus of Petit, or the new form; and were accompanied by hypopyon in all but three cases. They were much more difficult to heal and in every case left a corneal scar that interfered with vision.

#### CORNEAL ULCERATION IN FISH.—

**Henschen** observed that a large number of sharks and crayfish living in the fish tank which was placed in the sea, were attacked by an eye disease which began with a very superficial desquamation of the corneal epithelium, always appearing at the highest convexity of the cornea, and extending toward the periphery. The keratitis extended deeper until finally perforation occurred with prolapse of the iris and some times evisceration of the contents of the globe. He found the cause to be traumatic lesions due to their companions, especially the crayfish with their long spikes; and they were affected to a much less extent than the sharks.

#### TREATMENT OF CORNEAL ULCERS.—

**McHenry** gives a good review of the literature of the treatment of keratitis, his personal views including the avoidance of the use of cocain for the relief of pain in corneal ulcers, and substituting heat or opiates and dionin. He finds optochin useless in any but cases of pneumococcus infections, altho numerous authors have reported to the contrary. (Darier, Y. B., v. 13, p. 36.) **Dabney** also reviews the standard methods of treating corneal ulcers.



Keratotomy is advocated by **Foroni**, who reports the results of operation on two hundred cases in the last four years. (Y. B., v. 12, p. 115.) The infiltrated parts are outlined with the Graefe knife. The knife is then introduced at right angles to the surface of the cornea at as short a distance from the diseased parts as possible. The depth of the incision depends on the thickness of the cornea. It is self-evident that only the superficial areas can be divided. The inner margin is then grasped with the forceps, or with the hook, and the entire cornea within the incision is carefully dissected off. Care must be taken not to penetrate the anterior chamber or to expose Descemet's membrane. The peripheric portions of the corneal defect may show small yellowish infiltrative areas. These must be carefully removed. With the curet or with Desmarres' scarificator the entire cornea is scraped, the wound being continuously irrigated. The margins are then smoothed over with a pair of scissors. Then irrigate with 1-1000 bichlorid or cyanid of mercury. Then the entire conjunctival sac is irrigated with 1-5000 solution. Atropin is instilled and sterile xeroform applied. Healing takes place in from a few days to a few weeks. Severe pain and inflammatory symptoms disappear in twenty-four hours. The advantage is the slight opacity which remains. If there is a large central scar remaining, and very dense he dissects down a broad conjunctival flap, which exposes the sclero-corneal region, then introduces the point of the Graefe knife into the anterior chamber and performs iridectomy.

**Williams** believes that *pasteurization* is not used often enough and reports six cases brought to a successful termination with this method, the pain being brought under immediate control, as well as the tendency to spread. The method of Shahan has been described elsewhere (p. 8). **Burns** reported a case of marginal serpent ulcer in which he used the pasteurization treatment with happy result. He believes it was a pneumococcic ulcer although he did not take a culture.

**Young** has reported on the value of superheated air and other methods of treatment.

The use of collosol argentin is mentioned by **Boys**, who includes in a report of several successful cases, that of a girl of eighteen suffering from an ulcer which healed in an astonishingly short time after the instillation of two drops of the remedy.

An ocular therapeutic lamp is recommended by **George** and **Toren** (see p. 8), for the treatment of corneal ulcers, episcleritis and ciliary neuralgia. The lamp consists of a parabolic reflector containing a 50 watt electric light with a violet glass globe. It must be accurately adjusted so that the cornea will be a distance of 60 mm. from the front of the bulb, which is the focal distance of the reflector and will give a temperature of 170° F. in 15 minutes which was found to be the most effective temperature for treatment of these conditions. Experiments with cultures of virulent strains of staphylococcus aureus and albus, and streptococcus pyogenes show that the growth of the former is inhibited after thirteen minutes and they are killed in 15 minutes, while the streptococci are inhibited after 12 minutes' exposure and killed after 13 minutes. They believe that the violet color of the rays, as well as the heat is a factor in obtaining beneficial results.

After reviewing the various current methods of treating hypopyon keratitis **Verhoeff** describes the one which he has adopted. The patient, lying down and looking toward the ceiling, must keep this position throughout the treatment. The eye is thoroughly cocaineized, and a speculum inserted. The point of a Beer's knife is entered obliquely in the margin of the ulcer, and pushed thru to the opposite margin, going as deeply as possible without entering the anterior chamber. The back of the knife pushed toward the membrane of Descemet tends to displace it without its being perforated. Then the point of the knife is entered near the middle of the first incision and two radial cuts made, forming a crucial incision. The infiltrated border of the ulcer is curetted superficially with

the point of the knife. Next a solution of

Iodin .....	25
Potassium iodid .....	50
Water .....	100

is applied by a cotton tipped toothpick. The cornea being dried so that the solution will not spread to injure the neighboring epithelium. When the surface of the ulcer has been moistened, enough solution is added at the center to make a puddle. This is allowed to remain five minutes and quickly washed away by a jet of boric acid solution. In large, rapidly progressive ulcers, at the close of this treatment a puncture is made with the Beer's knife to drain away the aqueous, but not large enough to allow the escape of the hypopyon. In 42 cases, 21 small ulcers 4 mm. or less, and 8 of moderate size, had the process checked in every case. Of 13 large ulcers 8 were checked and 5 were not checked.

**CORNEAL REPAIR UNDER CONJUNCTIVAL FLAP.**—An interesting case of corneal repair has been related by **Ourga** in which, as the result of a shell explosion, the lower fourth of the cornea was destroyed, the gap being occupied by iris. There was a traumatic cataract. The day following the injury the conjunctiva was separated from its attachment to the cornea, the jagged edges of the corneal wound were cauterized, the conjunctiva was drawn over the cornea and its edges united by a transverse suture. Seven days later the stitches were removed and the upper portion of the conjunctiva began to retract and was in its normal position within two weeks. The lower part was firmly adherent to the margins of the wound forming a large opaque patch over the lower half of the cornea. There was slight bulging of this area, which gradually diminished and within four months disappeared entirely, while the loss of corneal tissue seemed to be replaced entirely, with intraocular tension normal. **Zentmayer** thinks this method of treatment deserves more attention. He reports a case of fistula following injury thus cured.

**KERATOMALACIA.**—Under the title of "eye diseases from deficiency of fat in food," **Bloch** reports the study of forty cases observed by him in the last five years at Copenhagen. In five cases there was xerosis alone; in twenty-seven, bilateral keratomalacia, and in seven others only in one eye. There was ulcer of the cornea in nearly every case. The age of the patients varied from a few months to a little over one year. Some died from their atrophy, some from extension of gangrene from the ulcerating cornea; others recovered. The hemoglobin was as low as 30 per cent in some and never over 80 per cent. A peculiar susceptibility to infectious processes was evident in the common rhinitis, otitic furuncles, gangrene or pus. Diarrhea was frequent. By the exclusion of syphilis, myxedema and other constitutional diseases, **Bloch** traced this entire set of symptoms to the food children had been getting, chiefly lack of fat. The majority of **Bloch's** cases date from the years the war has been in progress. Thirty-eight were from the rural districts and only 21 from the city; all the rural babies having been fed on centrifugalized milk. Treatment consisted in administering breast milk or cod liver oil. He sounds a warning that often serious eye trouble is masked by conjunctivitis, and that possibly many instances of blindness and leukoma in adults are due to unrecognized xerosis in infancy. The whole trouble can easily be cured by feeding with breast milk and cod liver oil, or cod liver oil and whole sweet milk.

**PARENCHYMATOUS KERATITIS.**—The enucleated eye of a case of parenchymatous keratitis was carefully examined by **Suganuma** with the following result:

General atrophy of the epithelial layer; near the limbus a subepithelial inclusion of a pannus tissue, in the parenchyma a dilatation of the lymph spaces, increase and necrosis of the corneal bodies—increase of the wandering cells, infiltration by white blood cells, coagulation and necrosis of the corneal lamellae. Descemet's membrane is well preserved, altho the en-



endothelial cells are lacking in the central area. At the root of the iris and in the ciliary projections are accumulations of cell infiltrates, the vessels of this region are partially obliterated. In the superficial layers of the sclera is a cellular infiltration, and the marginal vessels of the cornea show an increase in the endothelial cells and collections of white blood cells. The author believes that the disease can be traced to the syphilitic influence; which first develops its effect on the corneal bodies within the corneal parenchyma, followed by an increase and eventual necrosis of these cells. Good results from the use of salvarsan and mercury have been obtained by **Spencer** and **Almkvist**.

**Suker** believes there must be two types of this disease; one, in which the cornea shows small infiltrative spots with radiations emanating from these areas, and the other in which the principal feature is corneal striations. The first he believes to be a direct expression of the activity of the spirochete in the cornea, the process being not so deep, and more responsive to treatment. The second type he thinks must be due to a syphilitic toxin, lies much deeper, and consequently is not so amenable to antiluetic treatment but does respond some to tonic treatment.

**Stephenson** calls attention to a form of parenchymatous keratitis in which the ordinary salmon patch is replaced by a somewhat prominent fleshy looking mass, at first sight resembling nothing so much as a neoplasm. Other parts of the cornea present the ordinary appearances of this form of keratitis. Gradually the fleshy looking mass loses its prominence and sinks to the general corneal level. It is not followed by local bulging. In other respects such cases run the ordinary course of parenchymatous keratitis.

**Derby** reports upon the end results of parenchymatous keratitis, in a series of 96 cases, in two of which but one eye was affected. In 168 eyes more or less corneal opacity remained, in 14 none could be seen. In 171 eyes vessels were found in the cornea. In 15 they were absent. Posterior synechiae were

noted in 62 eyes. In 4 eyes there was slight opacification of the lens. In 11 vitreous opacities were noted. But in 38 eyes the corneal scars, or a permanently contracted pupil, made it impossible to examine the deeper structures. Of 148 eyes examined for changes in the choroid and retina 81 showed lesions, mostly rounded disseminated spots, situated in the equatorial region. The vision present was ascertained in 161 eyes to be as follows:

Number of eyes	Vision
32 .....	10/10
17 .....	7/10
18 .....	5/10
13 .....	4/10
25 .....	3/10
14 .....	2/10
17 .....	1/10
25 .....	less than 1/10

In some cases vision may improve as the child grows older, but in others it may be farther damaged by recurrences. These, **Derby** believes, are more frequent than existing statistics indicate. In 37 cases carefully investigated with reference to this point he found positive evidence of recurrences in 14, and probable in 3 others.

**TUBERCULOSIS OF THE CORNEA.**—**Goldbach** claims that in the majority of cases of lymphatic nodular keratitis, if we use all methods of diagnosis, we will find some evidence of symptoms that go with tuberculosis. The eye manifestations will at least make one think of tuberculosis and will aid us in checking a tuberculosis tendency. Of 39 cases reported 7 had pulmonary phthisis; 16 had some form of tuberculosis as cervical adenitis or tuberculous bone; 32 had a von Pirquet, 18 had adenoids and diseased tonsils (the tubercle was found 6 times in microscopic sections); 4 showed tubercle bacilli in the sputum; 8 physical examinations were suggestive of some form of lung involvement, 13 had Wassermann tests with 11 negative. Seven had one member of their family with tuberculosis. A clinical case reported by **Vidal Fraxanet** presented an isolated lesion deep in the cornea, ending in recovery.

In the discussion following the presentation of a case of tuberculous keratitis by **Garraghan**, **Suker** and **Dodd** laid particular stress on the necessity of small doses in diagnostic tuberculin tests, as well as caution against increasing the dose too rapidly, keeping the dose down to a point where there would be no marked focal reaction, coinciding with the views of **Woods**. **Cross** reported an interesting case of tuberculous keratitis where the vision was improved in 9 months from 5/60 to 6/9 from injections of tuberculin, preceded by small doses of **Mehnarto's** contratoxin.

**ARCUS JUVENILIS.**—**Kusama** reports three cases of juvenile arcus, and especially the microscopic and chemic findings with regard to two small pieces of tissue removed for examination. He found, contrary to what is the case in arcus senilis, that the epithelial layer, Bowman's membrane, and the parenchyma of the cornea, were all decidedly abnormal. There were vacuoles or fat globules in the epithelial cells. Interruptions and thickenings of Bowman's membrane, and fibrous changes in the parenchyma of the cornea, such as are never found in arcus senilis. The fatty substance in the cornea yields a glycerine ester, and the condition must be regarded as a kind of fatty degeneration of the cornea. No oxydase reaction was shown. **Basterra y Santa Cruz** reports a case occurring in a patient aged 30 years who gave no history of any family predisposition.

#### PRIMARY PROGRESSIVE DEGENERATION.

—**Axenfeld** places the corneal progressive degenerations of the cornea in four groups. (1) Chronic degeneration of the hyalin type nodular, **Groenouw**; lattice like, **Haab**, **Dimmer**; familial, **Fleischer**. (2) Progressive degeneration from deposit of uric acid salts. (**Uhthoff**). (3) Progressive fatty degeneration (**Tertsch**). (4) Progressive interstitial calcareous deposits. Of the fourth group he reports a case in detail, where the opacity first made its appearance as a bright spot in the right eye in the sixth year, until a complete ring was formed at the present time at the age of 35.

The entire cornea was involved except that corresponding to the pupil. Even this, examined with a lens, showed lattice formation. Vision was 6/12 with the right; 6/8 with the left. Microscopic examination of two small excised pieces showed numerous highly refractile particles without definite shape, soluble in sulfurous acid, from which calcareous crystals could be obtained. The epithelium was undisturbed and there was no evidence of an inflammatory process. The deposits seemed chiefly to lie in the corneal parenchyma.

**Axenfeld** under the name of *calcareous dystrophy* of the cornea describes a condition of progressively developing opacity in which the lesions are seated beneath Bowman's membrane in the corneal parenchyma. They consist of destruction of the corneal tissue which is replaced by a calcareous nodule, which is not affected by the ammonium tartrat.

**CORNEAL OPACITIES.**—**Santos Fernandez** reported 2 cases of spontaneous clearing of the cornea in children, one from ophthalmia neonatorum and the other of unknown origin.

**Hagen** reported a case of corneoscleral bleb which appeared three years after rupture of the globe from an axe. The protrusion occurred at the site of the rupture at the lower corneal margin, measuring 8 mm. by 10 mm. and encroaching 3 mm. on the cornea. Both walls and contents of the bleb were relatively transparent. Puncture of the cyst failed to produce any improvement in the eye, which was enucleated.

**Posey** reported an unusual progressive superficial opacity in the left cornea, at first free from vessels, and which responded to treatment but grew worse when neglected. The involved area was anesthetic. **Posey** explains the conditions as due to trophic change in the epithelium, in consequence of preceding inflammation of the conjunctiva. The case is similar to two cases reported by **Bordley** (*Y. B.*, v. 13, p. 119), due to trauma thru the closed lids.

**CORNEAL TATTOOING.**—On account of the dangers and unsatisfactory results



of corneal tattooing by the usual method, **Verhoeff** has injected India ink into the corneal tissue thru a hypodermic syringe. The ink emulsion was thoroly rubbed up and placed in a glass syringe with a medium sized needle. The needle is stuck into a cork and the whole placed in the sterilizer and boiled. Great care is taken that the needle shall not enter the anterior chamber, and the injection is checked while a narrow rim of the scar remains unblackened. For a large scar it may be necessary to introduce the needle at two or three points. The injection is followed by slight reaction which subsides in a week.

**Allport**, instead of tattooing the cornea with needles, scrapes off the corneal epithelium with a cataract knife, rubs the India ink emulsion into the raw surface with a cotton swab several times, and keeps the eye open for about ten minutes to allow it to stain the tissues. Sometimes the operation has required repetition to produce a sufficient discoloration. **Wyler** calls attention to the method of **Froehlich**, which he has modified and used with satisfaction. A very superficial flap is cut in the center of the cornea with a trephine and dissected up except at one margin where it is left hanging by a hinge of tissue. The India or Chinese ink emulsion worked up in mercuric chlorid solution is applied to the raw surface and the flap turned back in place. This gives a black, round imitation of the pupil, which has been permanent for as much as six years.

#### TREATMENT OF CORNEAL OPACITIES.—

**Jickeli** has tried a mixture of 10 per cent ammonium chlorid, with 1/5 per cent tartaric acid without success, in experimenting in an endeavor to clear up corneal opacities due to lime. Neither was neutral ammonium tartrate helpful.

An exhaustive review of the present status of corneal transplantation, with some experimental data and report of three cases operated upon by the method developed, is given by **Walker**. His laboratory experiments consisted of operations on twelve dogs, the first three of which were unsuccessful, due

to puncturing the anterior chamber. The later ones were more or less successful. He uses an autoplasic corneal graft with a conjunctival flap attached, the graft being somewhat thinner than the portion of cornea removed; technic for removal of both being on the principle of making a **Thiersch** graft, after first transfixing the cornea with a **Graefe** knife. We believe that if he were to split the cornea in making his grafts as well as in removing the opaque portion; he would not alone find the technic made easier, but that there would be less opacity resulting than where the flap is of varying thickness. **Leoz Ortin** reports a continuation of his studies in experimental keratoplasty.

To relieve a case of corneal staphyloma with complete obliteration of the anterior chamber, **Darling** first performed **Heine's** cyclodialysis operation opposite the widest area of sound corneal rim. The spatula, when in the anterior chamber separated the iris from the cornea; it was passed forward until the iris was somewhat torn from the corneal rim, (the spatula being well curved so that it hugged the back of the cornea). With the point of a keratome, using sawing movements, the spatula was cut down upon well back in the limbus so that the cornea would be left untouched and the iridectomy would be well to the root of the iris to give good drainage.

This incision was enlarged with scissors but a canaliculus knife, if very sharp, would have been better. The iris forceps were now introduced, the spatula removed, and an iridectomy of about 3 mm. wide was made at the first attempt. To make the iridectomy wider the spatula was reintroduced to get the iris forceps between the iris and cornea; this was done on one side and then the other of the primary attempt, giving an iridectomy of over 10 mm. wide well back at the root of the iris.

**CORNEAL STAINING.**—Cases of discoloration of the cornea following trauma and intraocular hemorrhage are reported by **Watanabe**. He believes the discoloration is generally due to the presence of hemosiderin in the cornea.

A pure green color appears only in the presence of cyclitis.

**CONICAL CORNEA.**—**Jackson** reports notes made on forty-eight cases of this disease and believes that while eye strain has its influence here as in posterior myopia, the general physical condition plays the most important part. He has found a generally depressed nutrition in almost every case he investigated. The points to which he especially directs attention are:

1. Keratoconus arises from yielding of the cornea to intraocular pressure during a period of impaired nutrition, commonly due to general disease.

2. It gives rise to curvature ametropia, about which the ophthalmometer and the shadow test give little information of value for the selection of glasses.

3. The subjective tests with lenses give widely variable results; and a decision as to the best lens is reached only after many trials, under varied conditions influencing the pupil.

4. It is extremely important that glasses should give the best vision under the conditions under which they will be used; without lid pressure, which is to be carefully avoided.

5. The treatment should include: Every effort to build up and sustain nutrition. The continuous use of a miotic in the worst cases, usually pilocarpin. The avoidance of softening of the cornea by any form of bandages. Under proper care operative treatment will rarely be needed. **Amoretti** discusses the relation of keratoconus to the internal secretions.

**Wiener** describes a new operative method for the relief of conical cornea. He excises an elliptical segment of cornea about 12 mm. long and 4 mm. wide, usually from the upper half. The excised portion embraces only about two thirds the thickness of the corneal tissue. The edges are then approximated by means of a previously described suture, tied over thin gold strips in the manner of closing a cleft palate. Just before the sutures are tied the anterior chamber is purposely punctured in order to more easily bring the edges together with less tension.

The sutures are permitted to remain about 10 days. While the technic of the operation is difficult, the results are at least as good as any thus far described with the advantage of involving less risk to the patient and very little scar. **Maggiore** reviews the methods of treatment for keratoconus.

**MARGINAL ECTASIA.**—**Marques** reports the case of a man of 46 who complained of impaired vision in the right eye. A white line, like the arcus senilis, ran along the outer margin of the cornea. It bifurcated, to form the crescent enclosing the area of ectasia, which comprised the inner two-thirds of the semicircumference of the cornea. The first sign of the anomaly was noticed at the age of ten. A similar case was reported by **Terrien**. **Ziba** also reports ectasia of the cornea in a man 24 years old, who had a nearly healed trachoma of the cicatricial type. The ectasia of the upper portion of the cornea contained blood vessels. This was not gerontoxon. Histologically it was found that Bowman's membrane was wanting, being replaced by a thin cicatricial membrane. There were no inflammatory changes in the parenchyma, but fatty degeneration was observed. The author ascribes the condition to cicatricial pannus following fatty degeneration, which later went into ectasia.

## SCLERA.

**BLUE SCLERAS AND FRAGILITAS OSIIUM.**—**Bronson** gives a history of disease in two families, one of 55 individuals in 4 generations, of which 21 had gray-blue sclerotics. Of these, only one, a boy of six has had no fractures. Sprains and dislocations are also common. The heads show an abnormal prominence of the frontal and occipital bones; in two, patency throughout life, of fontanelles. Of 8 adults with blue sclerotics, 7 had varying degrees of deafness. One died at 23 not affected.

In the second family, consisting of 8 individuals in 3 generations, 7 have blue sclerotics. Of these, 4 have had fractures, 2 others a tendency to sprains. All are able to lead a natural



life, except one child who is too susceptible to fractures. In this family the head has the characteristic shape frequently seen in osteogenesis imperfecta congenita; namely, increase in the bitemporal diameter, so that the ears turn downward and outward, and slight tilting downward of the axes of the eyes and an underhung lower jaw. There is no tendency to deafness or to arteriosclerosis. In both families the stature is below the average, with the exception of three members of the first family.

Another series is reported by **van der Hoeve**, who gives the family tree thru four generations of a family, in which eleven out of twenty-two members had blue sclerotics, extremely fragile bones and otosclerosis. Fracture and curvature of bones were common and nearly all the members of the family were delicately built. Seven of the nine personally examined had syndactylia.

The grandfather and four of his six children presented the trio of anomalies, and six of the seven of one of the sons affected, but all of the seven other grandchildren escaped.

**Goldbloom** reports the case of a man who at 33 suffered his forty-ninth fracture. Thirty of these had occurred by the time he was fifteen years old, the first being at fifteen months. He had "china-blue" scleras, but his family history was negative.

**EPISCLERITIS.**—**Simon de Guilleuma** advocates ionotherapy in episcleritis and describes in detail his apparatus for applying the same. The principal points are that the eye bath must be of glass, has an opening in one side to admit of the attachment of a rubber filling ball, has an electrode of carbon connected to a terminal on the other side, and, on top (the patient in the recumbent position), an air hole. The author insists on doing away with metals in the construction of the bath, and the necessity of transparency, so that the surgeon can see that the eye is open; on the perfect fit of the edges to the orbit, and on the cleanliness of the apparatus and the ease of refilling, should any liquid be accidentally spilt.

**SCLERITIS.**—**Delmiro de Caralt** dis-

cusses the morphology and pathogenesis of scleritis. He considers that the classification of de Wecker has retarded for a quarter of a century the knowledge of affections of the sclerotic, which are usually merely the secondary expression of disturbances of the uveal tract. In the author's own statistics the papular and papulo-ampullary forms owed their origin in ten cases to oligoarticular pseudorheumatism, seven cases to gonorrheal infection, fifteen cases to genital infections, two cases to malaria, five cases to smallpox or pneumonia, two cases to subacute posttyphoid enteritis, three cases to chronic enteritis, one case to an infection of the biliary passages, three cases to maxillary sinusitis, one case to mastoiditis, four cases to dental alveolitis, one case to parotiditis, and some others to tonsillitis. Of the subacute type, sixty-three were of the nodular form and only three gummatous.

In secondary scleritis connected with chronic uveal inflammations, **Fuchs** finds the tissue infiltrated with the lymphocytes and plasma cells; polynuclear cells being rare. The openings to the canal of Schlemm and the anterior vessels are always infiltrated. Those of the vortex veins and posterior ciliary arteries less so. In the episcleral tissue the infiltration continues along the vessels into the capsule of Tenon, and about the insertions of the tendons.

**REPAIR OF SCLERA.**—The histologic studies of this subject made by **Bonnefon** and **Fromaget** include the examination of aseptic experimental resections and of human eyes that have undergone sclerectomy. They conclude that cicatrization goes on in the sclera as in other connective tissues, the loss of substance being rapidly made good. By the third day they find the clot invaded by fibroblastic cells of obscure origin. In two months the continuity of the scleral coat is reestablished by a tissue more dense and less regular than the normal sclera. Only the inclusion of some foreign tissue arrests the process, and only when this foreign tissue is permeable is permanent filtration and hypotonus established.

## ANTERIOR CHAMBER AND PUPIL.

MARCUS FEINGOLD, M. D., F. A. C. S.

NEW ORLEANS.

This section reviews the literature of 1917 regarding the anterior chamber and its contents, and the pupil and pupillary movements. Closely related material may be found in the sections dealing with the uveal tract, the visual tracts and centers, tumors, and injuries of the eye.

**DEVELOPMENT OF ANTERIOR CHAMBER.**—This has been studied by **Speciale-Cirincione** in a large number of human embryos. It is closely connected with the development of the cornea, ciliary muscle, iris angle, and pupillary membrane, none of which exist before the beginning of the second month of embryonic life. At that time, between the crystallin vesicle and the ectoderm, appears a layer of large cubic elements, the beginning of the posterior layer of the cornea. A little later a ring of thickening appears in front of this layer, the beginning of the true corneal tissue. A little later a mass triangular in section forms back of this layer on the anterolateral surface of the crystallin, and becomes vascular. At the tenth week the pigmented external layer of the optic vesicle becomes thickened at its margin, and undergoes rapid growth, advancing in front of the crystallin. Between it and the endothelial cushion in front, appears tissue that develops into the ciliary body.

During the third month it becomes possible to distinguish a lamina similar to that of the corneal endothelium, which becomes the endothelial layer of the iris, and these two endothelial layers become separated, leaving the beginning of the anterior chamber. Shortly after the formation of this primitive fissure, spaces appear in front of the endothelial cushion which ultimately become the canal of Schlemm. At the end of the fourth month the cornea and ciliary body are well distinguished, the crystallin has assumed its proper form and the canal of Schlemm is present. But the iris and anterior chamber remain very rudimentary. From the fourth to the seventh month the anterior chamber gradually in-

creases its size corresponding with the increase in the surface of the iris. At the end of the seventh month the pupillary membrane still adheres to the cornea, but this adhesion is becoming weakened and its easy separation accounts for the view that the anterior chamber is already complete. By the eighth month the pupillary membrane has become less vascular, and sometimes is completely atrophied. After this, altho the anterior chamber is complete, it remains very shallow, becoming deeper after birth.

**AQUEOUS HUMOR.**—Secretion. Analyzing in detail the experiments made to determine the secretion of the aqueous humor and passing criticism on all theories advanced as to its origin and the ways of its leaving the interior of the eye, *Magitot* (4) arrives at the conclusion that the experiments so far conducted do not sufficiently reproduce normal conditions and that the conclusions consequently do not apply to the normal aqueous humor. The renewal of the aqueous is very slow and there is no true current of the aqueous. During the third and fifth month of embryonic life the first aqueous is secreted by special neuroglial cells of true holocrin nature which accompany the hyaloid vessels. The fluid thus formed fills the meshes of the vitreous body, the anterior and posterior chambers. The fibrillary network of the vitreous is nothing but retinal neuroglia. After the cells have disappeared the aqueous in later life is only very slowly absorbed and the deficiency is replaced by products of the retinal neuroglial cells, the cells of the ora serrata and the clear cells of the ciliary body. The eyeball has independent lymph channels for the anterior and posterior portions in the form of perivascular sheaths. Lymph and aqueous hu-



mor are two different fluids. They do not come in direct contact and they do not mix. When the anterior chamber is emptied by puncture the fluid filling the chamber consists of serum transudate from the capillaries with an admixture of normal aqueous humor which is squeezed out of the meshes of the vitreous body. Gradually the serum is eliminated and the neuroglial cells dialyze slowly new normal aqueous.

By means of special forceps, **Seidel** clamped the iris to the lens, thereby closing the communication between the posterior and anterior chambers. A watch glass placed over the eye prevented the iris from getting dry; after several minutes' observation no moisture could be seen on the iris. Over the iris a small glass bell was placed for several minutes; no moisture could be seen. A small ear speculum with a 12.0 D. lens was placed on the iris; after several minutes a reflex appeared in the middle of the iris and on the iris margin, which reflex disappeared after careful sponging. From this can be concluded that only very scant secretion of the iris exists which can be estimated to be about 17 milligrams or about one-fourth of a drop per minute. The secretion of the ciliary body, on the other hand, can be estimated to be about three-fourths drop per minute. These measurements were made with the ocular tension equal to zero and consequently under conditions favoring increased secretion. The normal secretion, therefore, is very infinitesimal. These experiments do not permit the statement that the normal ocular tension is sufficient to prevent filtering from the iris vessels.

**CYST IN ANTERIOR CHAMBER.**—The cyst in the anterior chamber in **Goldberg's** case developed after a perforating wound of the eye, was of the pearl tumor type and consisted of epithelium and connective tissue which had been carried into the anterior chamber through the wound at the time of the accident. Two operations were performed, each time parts of the iris were removed with the tumor. The vision was good and extension into the deeper structures not notice-

able clinically. **Goldberg** considered the iris had been too deeply invaded by the growth to make radical removal possible.

#### REMAINS OF PUPILLARY MEMBRANE.

—**Jackson's** two cases of slight remains of pupillary membrane are extremely interesting because they illustrate how easily these conditions can be overlooked even by careful examiners and even during repeated examinations. In the one case a brown mass was found near the upper edge of the pupil, apparently connected with the sphincter region and lying in front of it, together with a fine line on the anterior capsule. In the other patient a fine thread connecting two points of the anterior surface of the iris was only visible with dilated pupil, but was lying entirely in front of the iris and difficult to see as long as the pupil was contracted. **Ridley** reports a case in which a mass of pigment was present in the anterior chamber.

#### CENTERS OF PUPIL MOVEMENTS.—

**Dunn** proposes a new theory of the paths for the pupillary reflexes. The direct light reflex or "the primary light reflex" is, according to him, a reflex belonging to the automatic system, a vegetative reflex. Its path is: Retina, nerve cells to the pigment layer and along this to the ciliary region, where impressions are made upon the sensory nerve terminals therein, which impressions are conveyed to the ciliary ganglion, where they arouse efferent impressions along its motor fibers to the sphincter pupillae. The consensual light reflex is the result of nature's effort to obtain for any object directly looked at a like illumination in both eyes. Its path is: Retina, optic nerve, chiasm and tracts; from here a part goes to the center in the geniculate and quadrigeminal regions and then the fibers pass to the third nerve nuclei. Another part of the visual fibers goes to the sympathetic subthalamic ganglion, for the purpose of stimulating the action of the sympathetic on the dilator iridis. It is possible, he says, that the cones represent the terminal mechanism for the reception of the impulses to the geniculate and quadrigeminal nu-

clei, and the rods of the impulses to the subthlamic ganglion.

**MYDRIASIS FROM NASAL OBSTRUCTION.**

—**Lopez's** patient, a teacher, suffering with hypertrophy of the inferior turbinates, worse on the left side, showed during the attacks a certain parallelism between nasal obstruction, and diminution and discomfort of vision which compelled him to take off his glasses and to clean especially the one corresponding to the left eye. Improvement of vision followed with a reduction of the respiratory trouble. During the attacks the right pupil was normal, the left one was wide and did not respond to light or accommodation. No other nervous symptoms were present. A few minutes after the application of cocaine and protargol to the nares the mydriasis disappeared and both pupils reacted again normally. These symptoms were, according to Lopez, due to a spasm of the dilator pupillae as a result of an irritation of the sympathetic system started in its ramifications in the nose.

**MIOSIS—PARALYSIS OF CERVICAL**

**SYMPATHETIC.**—Continuing their investigations of sympathetic nerve paralysis (Y. B., Vol. 12, 1915, p. 349), **Metzner** and **Wöflin** arrive at the following conclusions: Following the extirpation of the superior cervical ganglion in the rabbit, the difference in the size of the pupils is permanent, while the vascular symptoms in the ear are only transitory. Mild stretching of the cervical sympathetic in the rabbit produced oculo-pupillary symptoms, which will disappear entirely at times. Depigmentation of the iris did not occur in any of the experiments in which the superior cervical ganglion had been extirpated or the nerve severed below. Miosis was a regular occurrence after middle ear evisceration. The vascular symptoms following destruction of the middle ear disappear after a while and the oculo-pupillary symptoms remain. The experiments on the rabbit give results similar to those gained by clinical observations on the human being; that the vascular changes will disappear while the oculo-pupillary symptoms remain unchanged. This is explained on

the assumption that the muscular apparatus of the blood vessels forms an independent and regulating tonus producing apparatus. The muscle fibers of the iris do not regain their tonus and they cannot be classed with the muscle fibers of the blood vessels on account of their different embryonic origin.

**PHYSIOLOGIC INEQUALITY OF PUPILS.**

—While both pupils are of the same size when the eyes are looking forward, **Tournay** finds that if the eyes look to one side, the pupil of that side becomes larger after a short while, while the other pupil contracts.

**ARGYLL ROBERTSON PUPIL.**—On the basis of his theory of the pupillary reflexes **Dunn** (see above), gives the following explanation for the Argyll-Robertson pupil: The specific toxins of lues have a selective action on the ciliary ganglion and if the lesion is here confined to the sensory elements, we have the abolition of the primary reflex of the ciliary ganglion which gives us the Argyll-Robertson pupils. After destruction of the sensory-motor and sensory-sympathetic connections in the ciliary ganglia motor impulses from the third nerve nuclei can still reach the sphincter of the pupil with the result that the Argyll Robertson pupil is a contracted one. While the sympathetic connections with the ciliary ganglia are destroyed, impulses from the sympathetic subthlamic centers can still reach the sphincter muscles via the long ciliary nerves and this explains why the pupils are kept equal during accommodation. If the toxins affect one ganglion more than the other, or sooner than the other, inequality of the pupils is the result.

**HEMIANOPIC PUPIL REACTIONS.**—Applying his theory of the paths of the pupillary reflexes to the hemianopic pupillary reaction **Dunn** says: "If the lesion is in the optic tract anterior to the point where the fibers to the corpora quadrigemina and subthlamic ganglia are given off, the consensual light reflex is abolished for no retinal born impulses can reach the quadrigeminal region." The primary light reflex is abolished as soon as "degeneration of the retinal cells takes place. The pri-



mary light reflex cannot then be aroused by the impact of light on the blind halves of the retina. Because, owing to the degeneration of the retinal fibers to those areas, there is no activity in the pigment cells in response to light rays." If the lesion be posterior to the point where the fibers to the third nerve and the subthalamic ganglion are given off, primary and consensual reflexes are present from the blind area because "degeneration of the optic fibers anterior to the corpora quadrigemina and the subthalamic ganglion do not take place and the retinal cells remain responsive to light impulses."

**PUPIL IN DEMENTIA PRECOX.**—In a study of the disorders of the pupil in dementia precox **Reichmann** enumerates the observations of others. The psycho-reflex (dilatation of pupil with mental effort, effects, etc.), and the reflex enlargement after sensory stimuli were often found absent by **Bumke** in

catatonic stupor. **Westphal** found the pupil horizontally oval and with diminished light reaction; he called it catatonic stiffness of the pupil. This change of the pupil has also been found in catatonic excitement by **Albrand**. Pressure on ovarian points produces dilatation of the pupil with absence of light reaction, according to **E. Meyer**. **Reichmann** in her own examinations found 61 cases with unusually large and 31 with very small pupils; in 47 cases the pupils were not round; they were unequal in 30 cases and eccentric in 17 cases; hippus was present in 8. In the normal individuals she found 20 very large and 14 very small pupils; 15 times the pupils were not round and 19 times unequal. In 11 cases the pupils were eccentric.

In membranous occlusion after an infection, following cataract operation, **Ziegler** succeeded by the use of phylacogen injections to produce complete absorption of the exudate.

## THE UVEAL TRACT.

CHARLES ZIMMERMANN, M. D., F. A. C. S.

MILWAUKEE, WISCONSIN.

This section reviews the literature of diseases of the uveal tract for the year 1917. Sympathetic uveitis will be considered in the section devoted to Sympathetic Disease; and many important papers bearing upon the etiology of uveal inflammations will be noticed in the section upon General Diseases, which will appear later in the year.

**ANOMALIES-HETEROCHROMIA IRIDIS.**—**Ellett** reported 6 cases of heterochromia iridis, 2 of these with uveitis, 2 with cataract, and 2 with cataract and glaucoma. These pathologic changes occurred, as always, in the lighter colored eye. The difference in color may be due to the fact that no pigmentation takes place in one eye; or that it has been present, but is subsequently lost through some pathologic process. **Ellett** thus summarizes these changes:

1. Evidence of a chronic low grade cyclitis.—Rarely is there any ciliary injection or manifest changes in the iris or choroid, or subjective symptoms, such as would attend these changes. What we do find are vitreous opacities

and deposits on the posterior surface of the cornea. In **Ellett's** experience, the vitreous opacities are much the more frequent.

2. Development of cataract.—The peculiarities of this cataract are, in the first place, the youth of the patient, since it generally appears before the age at which we would expect to see cataract. It would be well to examine carefully the cases of juvenile cataract, not of the zonular type, and cataract occurring in persons under fifty, and limited to one eye, for evidences of heterochromic cyclitis. Another peculiarity of this cataract is that the other eye is, and remains, free from a similar disorder. The cataract pursues an ir-

regular course, but since the progress of all cataracts is extremely uncertain, it is perfectly regular as regards this feature. It tends to progress to maturity and there is no contraindication to its removal.

3. The development of glaucoma simplex.—This is by no means the usual termination of this disease, as only a few such cases are recorded. Ellett has seen only two such, although it has been carefully looked for. The glaucoma may follow extraction of the lens, or it may occur in an eye in which the cataractous lens is still present. The underlying cause of this condition is not known. Most of the speculation on the subject is along the lines of a lesion of the cervical sympathetic. Cases of injuries to the sympathetic nerve during birth and in other ways have been recorded, in which heterochromia iridis followed, but in several such cases of injury reported from the European battlefields nothing of the kind has been observed.

Ellett also gives under "allied conditions" the clinical histories of 5 cases of chronic uveitis with some attendant discoloration of the iris, presenting vitreous opacities alone or vitreous opacities with visible evidences of inflammatory processes in the iris, ciliary body, or choroid. Associated with or following these changes is an increase in intraocular tension. When this is present as an accompaniment of iritis, there seem to be two classes of cases—one in which the usual treatment of iritis is followed by a subsidence of the hypertonus, and another group in which the hypertonus is aggravated by atropin. The differentiation of these two is difficult, and the management of the second group is even more difficult. Some of the difficulties will be indicated by perusal of the case histories.

**ANIRIDIA.**—Hill reported the case of a girl, aged nine years, whose vision had always been poor; the eyes had always oscillated and the pupils were very large. There seemed to be practically absence of the iris; the ciliary processes were not visible; the cornea, lens and vitreous were clear, the fundus appeared normal; there was myo-

pia and astigmatism. Family history negative; no history of similar ocular defects obtainable. The nystagmoid movements resembled the searching movements of an almost blind eye, more than nystagmus. At times, a vertical, and also at times a horizontal, motion is more noticeable than the others. She had glasses three years ago correcting 2.50 D. myopia and 3.25 D. astigmatism, which now give 20/100 vision. Refraction showed a little more than 2.50 D.M. in each eye, and —4. cylinders in each eye gave  $V=21/70$ . The absence of the corneal or lenticular opacities seemed to be somewhat unusual and the absence of any evidence of heredity was very unusual.

It is supposed that absence of the iris is the particular eye defect which most often shows a history of some ocular defect in past generations. The theory generally accepted is that it is a defect of development and not the result of an intrauterine inflammation. Hill thought that perhaps the theory of Hess, supported by George Coats, that there is a mesodermal structure advancing around the lens which means a new growth and the iris eventually protrudes these two, allowing the entrance of the iris between the lens and cornea, was a good one. All of the theories suppose that there is something which interferes with the pushing in of the iris between the cornea and the lens. Hill emphasized the frequent inflammatory reaction after any attempt to operate upon these cases. So far as he knew there were very few reports on the anatomic findings in these eyes. Generally there were the rudiments of the ciliary processes; there was some stump of the iris which had been adherent, and there had been reported a considerable overdevelopment of the pectinate ligament, the condition remaining in the adult eye as it was in the fetal eye.

In the discussion Mann reported a similar case in which the best vision he could obtain was, for the right eye,—9. gave 20/200, and the left —5.5 gave 10/200. The patient was a drug clerk who was using —6. and said he could



not read well with his glasses. The lens had a number of striations and the fundus was indistinct. He was given bifocals, and with the addition of +3.50 for close work he could read Jaeger No. 6. There was no heredity. In **Small's** case, aside from the aniridia, which he considered congenital, both corneas were sclerotic. The patient was thirty years old; she had gone to school and could see perfectly well until she was about fourteen. The first symptom was a cataract which developed in the right eye. The white spot appeared on the cornea shortly afterward, and increased until it covered the lower part of the cornea. In the left eye she has striae, visible around the periphery of the lens. There was marked lateral nystagmus. Family history was negative.

**POLYCORIA.**—**Chance** presented a case of imperfection of the iris, which he considered to be allied with polycoria, in an Italian girl of 11, who had a history of inflammation of the left eye in her early childhood. A linear opacity in the cornea doubtless interfered so much with the sight that the school physician had sent the case for refraction. There are no visible signs of connection between the corneal nebula and the iris; nor evidences of disease of the lens, choroid, or retina. A horizontal coloboma appeared to be at the outer side, which, on closer inspection, consisted of imperfectly developed superficial layers of iris, with a dense hyperplastic over-development of the deeper fibrous layer. The fibers extended quite visibly for some distance above and below the main aperture, and shone through the feebly developed overlying layers.

Directly opposite at the nasal side, there is a circular aperture, which, when the ophthalmoscope is used, transmits the light thru a distinctly fibrous background. In the right eye, in an exactly corresponding position at the nasal side, is a similarly rounded area which has the appearance of being only the deepening of a crypt, and does not transmit the fundus glare. Atropin effected complete mydriasis in the right, when the eye was found to be entirely

normal. Atropin in the left caused contraction of the nasal pillar, but apparently had no effect on the temporal.

**COLOBOMA.**—The extreme difficulty, and in many instances the absolute impossibility, of adequately solving the etiologic problem in certain faults in ocular development is illustrated in the pronounced defects in the cases of the mother and two children in the one family reported by **Ring**, and it is suggested that there may be an association between a vicious prenatal environment and the development of the ocular defect. The mother shows the following condition: O. D. The iris below is notched or slightly folded upon itself, and the pupil when dilated alters the position but slightly. At the posterior lens pole is a dense white opacity. Nuclear riders are present and numerous dots of intensive denseness suggestive of calcareous changes are scattered throughout the largely opaque lens. O. S. Coloboma of the iris below, with similar irregular lens opacity. Microcornea in each.

In the child exhibited, microphthalmos is present in each eye. In the posterior cortex of the right lens is an irregularly round chalky nodule, and the area of the nucleus is marked by a number of riders and several small dotlike opacities. O. S. Same character of nodule, nuclear area is present but less distinct, chalky dots absent. In both eyes the iris below shows a concave depression corresponding in location to the coloboma of the mother. The second child with a congenital defect died at five months, but had microphthalmos, double coloboma, and lenticular opacities similar to those of the mother and child shown.

The rather vicious prenatal history of this mother is of interest. On the paternal side the father was a confirmed alcoholic and user of tobacco, now dead. The mother is living, aged sixty-two years. During her married life she was compelled to submit to exceedingly harsh treatment, received insufficient food and at times lacked even shelter. She gave birth to eight children—four boys and four girls—at periods of about twenty-two months.

the patient being the fourth in order. Previous to the birth of the patient the ill-treatment accorded her mother was particularly wretched.

The patient was a victim of poor health during the first two years of her life, passed through measles and a very severe attack of typhoid fever, but from twelve years of age and onward she has had very little physical discomfort. Her first child died at seven months of gastro-enteritis; the second, one of the patients shown; the third dying at five months who presented the congenital defect referred to, and a fourth child, now aged four months, shows no lesions whatever in either iris, choroid, or lens.

Ring says that a number of the textbooks fail to mention the association of congenital cataract with the iris defect; but that Fuchs refers to the frequency with which cataract develops with coloboma of the choroid, and regards the cataract as usually complicated and inoperable. In view of the increasing haze of each lens Ring feels warranted in doing a series of careful dissections, beginning with a vertical incision through capsule into lens extending from the lower to the upper margin of the dilated pupil. In the discussion before the Ophthalmic Section of the College of Physicians of Philadelphia, the consensus of opinion favored the procedure proposed.

**Zentmayer** observed in a woman, aged 35 years, who stated that her vision had always been defective especially in O. D., two large wing-shaped areas of defective choroid, spreading from the optic nerve to the temporal and nasal parts of the fundus. The defect in the choroid was complete. The papilla was oval and presented at the scleral ring on the temporal side a porus opticus thru which the retinal vessels emerged. Myopia 8 D. The eye was divergent, but this had been corrected by an O'Connor advancement of the internal rectus. O. S.: The choroidal defect was much less extensive and not complete, the choroidal vessels being present and showing, in places, sclerosis. Myopia 3 D.

**Grimsdale** showed a case of congeni-

tal absence of the choroid. The masses of pigment were not heaped up, but apparently lay flat. Vessels were scattered over the greater part of the white sclerotic.

**Fagin** presented a man, aged 45, who noticed lately that for reading he has had to strain his eyes. The vision in the left eye is very poor, and has been for some years. Objects are blurred and indistinct. Right fundus normal; the left shows spots of choroiditis and congenital disarrangement of blood vessels with some pigmentation in places in front of blood vessels. V.= 4/200, unimproved with glass. Fagin had been unable to find anything that looked like it in any work upon the fundus. In the discussion Ellett thought the condition was congenital and is what has been described as the "Medusa Head" appearance of the nerve. The pigment in some places lies in front of the blood vessels, but one conspicuous lesion between the nerve and the macula is evidently deeper than the retina. While this does not have the appearance of a coloboma of the choroid it might be something of that nature.

**ANATOMY AND PHYSIOLOGY.**—With extremely delicate sections **Susita** was able to prove that the lower epithelial cells of the iris belong to the dilator system, a fact that has never before been proven.

**Joseph** found that *adrenalin* solutions of various concentrations, when applied to the sphincter pupillae after either partial or complete excision of the muscle, cause a prompt and unmistakable relaxation. This relaxation is maximal following the use of stronger adrenalin solutions (1:100 to 1:1,000,000). Very dilute solutions (1:10,000,000), on the other hand, produce only a partial relaxation. The duration of the effect varies directly with the concentration of the solution used; after 1:20,000,000 recovery may be complete within two to five minutes, whereas after 1:1,000 two hours or more may be necessary for recovery. The sphincter muscles of the following irides were tested: Bovine, swine, sheep, goat and human. The changes in sphincter length



were recorded graphically. These experiments demonstrated that the sphincter muscle of the iris is capable of responding to a suitable stimulus in a sense that is exactly the opposite of shortening (contraction), namely by lengthening (relaxation). In its response to adrenalin the sphincter of the iris resembles the intestinal.

**ETIOLOGY OF UVEITIS.**—According to **Woods** the anaphylactic theory of sympathetic ophthalmia assumes that the disintegrating uveal tissue in the exciting eye is absorbed and creates a hypersensitiveness of the second eye. A reaction between the antibodies formed in the sympathizing eye, and the exciting uvea, produces an intoxication which is manifested clinically as a sympathetic ophthalmia. In his previous papers of this series (1, 2), **Woods** has shown that if the eyes of an animal, generally sensitized to a given protein, are perfused with normal defibrinated blood to which the same protein has been added, anaphylactic phenomena result in the eye. These phenomena consisted in a marked contraction of the pupil and the occurrence of hemorrhages in the fundi. This ocular reaction was utilized to determine the antigenic properties of uveal tissue. As a result of numerous perfusion experiments, it was found that uveal tissue could act as antigen in animals of the same species, and could produce anaphylactic phenomena in the eye of a generally sensitized animal, by intoxication through the blood stream. Further, uveal tissue was organ specific, anaphylactic intoxication being produced by perfusion of uvea of another species. At the same time, it was shown that there was considerable reason to believe that the pigment in the uveal tract was the constituent uveal tissue responsible for these remarkable antigenic properties.

Accordingly, using the ocular anaphylactic reaction to perfusion as the method, an experimental study of this question has been made by **Woods**. Having prepared finally a pigment emulsion which is at least relatively pure, is readily absorbed, and which can be utilized in perfusion without causing thrombosis or plugging, **W.**

proved by perfusion experiments that this pigment is the constituent of the uveal tract responsible for the peculiar antigenic properties of uveal tissue. This pigment is a nitrogen, hydrogen, carbon, oxygen, iron, sulphur, and phosphorus containing body, is either a protein or closely allied to proteins, possesses antigenic properties, can act as antigen in the homologous animal, and is organ specific, and not species specific. These antigenic properties of pigment are those required if the anaphylactic theory of sympathetic ophthalmia is a possibility. The findings reported here confirm **Elschnig's** findings, and give a definite scientific basis to the anaphylactic theory of sympathetic ophthalmia.

Literature abounds in clinical histories demonstrating the importance of *focal infection* in the etiology of iritis, iridocyclitis and choroiditis, from: the tonsils by **Babbitt, Dulaney, Dunn, McCool, Sobotky**; pyorrhea, and alveolar abscesses by **Black, Foster, Gradle, Hardy, Lang, Levy, McCool, Oulton, Paton, Reeder, Rowe, Swift, Thompson, Turner**; suppuration of middle ear by **Dulaney**; nasal sinuses by **Dulaney**, and **Irons and Brown**; ulceration of the cervix by **Taylor**; alimentary tract in 23 patients of **Lang**; constipation by **Taylor and Thompson**; dysentery by **Morax**; appendicitis by **Reeder**; affections of the bladder due to infection with bacterium coli, which may have come from the alimentary tract in view of the presence of constipation in the cases of **Davies**; chronic, urethral infection with partial stricture by **Babbitt**; genito-urinary system by **Lang**; septic focus on the skin or on a mucous membrane or cavity in 10 patients of **Lang**; ulcerated matrix of a very badly ingrowing toenail by **Taylor**; influenza by **Lang and Smith**, showing that if the focus of infection is found and eliminated, a brilliant result can be obtained. In 200 cases of iritis in **Lang's** private practice the various causes occurred in the following percentages: syphilis, 6; gonorrhea, 12; tubercle, 11; general affections, 8.5; other causes, 25.5; pyorrhea, 37.

In no less than 74 of the 200 patients of **Lang** the sole cause found was pyorrhea. When these cases were seen early and the offending stumps or teeth were removed the clearing up of the iritis was strikingly rapid. Of the remaining cases 22 had pyorrhea in association with other diseased condition. In the case in which pyorrhea alone was found there were twice as many women as men. Of the total number 48 per cent had their mouths affected. It would be of great value if members of the dental profession could recommend a preventive of this appalling state of affairs, which seemed to lay the foundation for numberless diseases involving all parts of the anatomy, including the eye.

**Swift** emphasizes the importance of focal infection in the alveolar process. There are in general three types of teeth in which Swift looks for the source of trouble: (1) Crowned teeth. As a general rule a dentist has cut down and destroyed or exposed portion of the tooth in cases where a crown is used. It is in that type of decay wherein the tooth is nearly gone and a root alone is left that crowns are advised. In order to hold the crown two things are necessary: First, to destroy the nerve, devitalization; and, second, to form a band around the root to fix the crown. Both of these lead to abscesses. The result of faulty filling of the nerve canal is an apical abscess at the root; of faulty bands on the outside, pyorrhea.

The second type is the peg tooth. Of all poor dentistry pegging of teeth takes first place. If this is doubted, take a series of X-ray films and see how frequently the peg misses entirely the canal, perforates the wall of the root. The dentist purposely drills at the side of the canal for greater support but perforates the outer wall. This is especially true in front teeth owing to the fact that the root often bends backward. The frequency of apical and marginal or lateral abscesses has convinced Swift of the danger of its presence in all cases of peg teeth.

The third type appears in old broken roots. These can easily be diagnosed;

usually they are loose. The old roots where the tooth has broken off years before, small portions of roots left by the dentist, malformed roots, misplaced roots and finally decayed roots are the source of alveolar abscesses. They are hard to find, often found only accidentally or after filming for another tooth abscess.

**Turner** thinks that much might be done in the way of prevention by avoiding sticky foods. He had looked through the skulls of various races and various ages of mankind, as well as skulls of animals, and they followed the one rule: Where the food was sticky, starchy, and sugary, decay and pyorrhea were found; where the food was only meat, neither decay nor pyorrhea existed.

**MODES OF INFECTION.**—**Babbitt** reminds us that the eye contains every tissue necessary for the growth of bacterial organisms, besides the highly sensitized nervous tissues which readily succumb to bacterial toxins. The abundant blood supply with the terminal arteries and capillaries are further conducive to the localization of bacteria that circulate in the fluids of the body. **Lakin** strongly supported the view that in iritis a microbial infection was at work, due to an embolic process. He believed the reason the iris was affected was that at the junction of the iris and the ciliary body there was a change in vascularity from a highly vascular to (comparatively) an avascular arrangement, the later containing less hemoglobin and less oxygen, and hence organisms were able to flourish there.

**Turner** discussed the subject from the standpoint of the odontologist, saying that probably the causal agent was an infection by means of the blood stream or lymph stream, either toxic or, more probably, actually microbial; and seldom by direct continuity of tissue. Only seldom was a mouth seen which was free from the possibility of infection. Even when the last tooth had gone and a plate was substituted the danger had not gone, for an artefact factor was introduced in the production of dental sepsis. When the periodon-



tal sulcus was infected it was a practically undrainable area. When sticky food was eaten the area referred to, close to the neck of the tooth was not cleansed, and a nidus was thus formed for the multiplication of germs. A second source of sepsis was by caries and a septic tooth. A dead tooth always was septic so long as it remained in the mouth.

The general impression which has hitherto obtained is that these metastases occur thru the blood stream, but **Levy's** observations have led him to the conclusion that this belief is not substantiated by the clinical evidence. With one exception, all the patients cured or materially benefited presented dental infection on the same side as the affected eye. If the belief that these metastases occurred thru the blood stream was correct, Levy feels he should have observed more cases in which cure or material improvement occurred, when the dental infection was on the opposite side from the affected eye. Failing to have seen such cases, he has been led to the conclusion that these eye metastases, occurring from primary dental foci, travel thru lymphatic channels. He has recently endeavored to demonstrate the correctness or fallacy of this belief by means of animal experimentation, but unfortunately, the number of experiments carried out so far are too few to arrive at any conclusion. Animals injected intravenously or thru lymphatic channels have all died without presenting any eye lesion whatsoever. L. has been using rabbits for this work. But as they are particularly susceptible to streptococcus infections and succumb very readily thereto he feels he will have to secure animals less susceptible in order to carry on further investigation.

According to **Swift** we must have, first, the toxic material in the blood in a greater degree than the individual can easily assimilate; in other words, there must be a residual amount of toxic substance in the blood. Second, there must be some change in the eye from the normal which causes an additional decrease in the protective pro-

cesses of the eye. If it is strain it may result in a cyclitis, a trauma may result in a cyclitis, iritis, scleritis, etc. If these two essential points, presence of residual toxic substances in the blood and lowered resistance locally, are essential in every case of eye lesion due to focal infection, Swift asks, does it not appear rational to assume that one should consider all etiologic factors as essential and possible causes of the general toxicity residual in the blood rather than exciting causes of, say a simple iritis?

With the exception of the peridental tissues, **Dunn** considers it highly probable that a chronically infected tonsillar crypt is more frequently the origin of inflammation of the iris than disturbances anywhere else along the upper mucous membranes. The crypts of the tonsils, furnishing heat, nourishing food, and rest, are ideal places for germ growth. In early life the continued presence of microorganisms and their products within the crypt results in tonsillar hypertrophy. As years go by, this hypertrophy to a greater or less extent disappears and it frequently happens that the crypts are left enlarged and so distorted that their contents cannot be emptied during the act of swallowing. The continued presence within the crypt of the cast off epithelial cells, live and dead microorganisms and their products, results in the formation of the well known dirty, whitish, stinking masses and also, sooner or later, as the result of pressure in the destruction of the epithelial lining of the crypts, and often in superficial ulceration of the underlying tissues. These three things may persist in varying degrees thruout life and the passage into the blood of the germs and their products present in the crypts is often the cause of inflammation in distant organs resulting in e. g., thyroid hypertrophy, articular rheumatism, appendicitis, endocarditis, etc. Where the cryptal mucous membrane becomes ulcerated, and it often does, there results a more or less constant passage into the blood of microorganisms and their products. This helps us also to understand the recurrence of

local secondary inflammations such as iritis, focal choroiditis, scleritis, etc.

Of the microorganisms which pass into the blood from the infected crypts the vast majority are destroyed by the blood cells before they reach tissues where the conditions are such that they can intrench themselves and produce local inflammation. When, however, they have once found such a receptive focus and have inflamed it, they often leave this focus, even tho driven out by treatment, in such a weakened condition that the same species of microorganism can later reproduce there an inflammation similar to the first. Consideration of the pictures presented in chronic tonsillar crypts will make it clear how in the peridental infection we have to deal with similar conditions. In iritis or focal choroiditis we often find disease of both the dental regions and the tonsillar crypts, and it is impossible to decide from which of the two the microorganic invasion which has resulted in the ocular inflammation is taking place. It will be necessary in such cases to remove both foci to obtain the cure we are seeking. Ormond thought Turner's contentions proved rather too much, for on his theory iritis should be much more common than was the case, especially in out-patient ophthalmic practice, where the condition of the general run of mouths was deplorable.

**ARTHRITIC IRITIS.**—Smith has been working at the causation of arthritic conditions for eight years, and the evidences which he had obtained that bacteria, or the toxins, were the chief causes of arthritic trouble were derived by studying vitiated conditions of blood, most of which he believed were brought about by bacteria. The toxins and the bacteria prepared the ground; it was the element of strain or injury which determined the site. Therefore he had considered it sound practice to recommend every arthritic person to have his refraction carefully tested by an expert, for he believed many cases

of iritis might be prevented if eye-strain were avoided. He examined the blood of 450 people, most of them suffering from "chronic rheumatism" or gout. In 8 iritis was a secondary trouble. In 4 of the cases the influenza bacillus or its toxin was answerable, in 3 the tubercle bacillus, and gonorrhea in only 2 cases. The toxins of streptococci and staphylococci were present in all the 8 cases, and in 3 bacillus pyocyaneus, which latter was a very depressing organism and was a common inhabitant of the alimentary tract.

Dulaney considers rheumatism itself in the usual sense due to a focus of infection some place in the body. Iritis occupies the same position in regard to other infections as does rheumatism, especially those infections where the cocci are the offending organisms. De Schweinitz and How recorded the clinical history of a boy, aged five, with chronic polyarthritis, and the family history of tuberculosis on the father's side. At the age of three years the child first developed arthritis of both knees. Two years later the left elbow, both wrists, and the joints of several fingers were involved, with slight ankylosis of the jaw and enlargement of the axillary, cervical and inguinal glands. No good effect followed removal of the tonsils. Tuberculosis tests and Wassermann, thrice repeated, negative. About three years after the first arthritic process had begun, iritis of the right eye developed, which subsided under treatment, only a few posterior synechiae remaining. Not so with the left eye, which, as a result of numerous relapses, passed into a condition of chronic irido-cyclitis, with infiltration of the cornea, especially in its lower part, with slight vascularization, filling of the anterior chamber with yellowish exudate, traversed with a band of hemorrhage. The constant exacerbations of cyclitis, uninfluenced by treatment, necessitated enucleation.

(Continued next month)



# DIGEST OF THE LITERATURE.

## THE UVEAL TRACT.

CHARLES ZIMMERMAN, M. D., F. A. C. S.

MILWAUKEE, WISCONSIN.

(Continued from March issue)

The microscopic examination revealed swollen and edematous corneal plates, with capillary vessels in the middle layers of the corneal stroma, the anterior chamber filled with an albuminous exudate. Completely closing off the anterior chamber posteriorly there was a dense band of fibrous tissue, about two-thirds the thickness of the cornea, and somewhat resembling it in structure. This curtainlike band, which extended from one angle of the anterior chamber almost to the other angle was somewhat adherent to the iris, although sharply differentiated from it in structure. The iris itself was densely infiltrated with small lymphoid cells; and thruout the stroma, but chiefly at its base, were numerous large plasma cells. The ciliary muscle was atrophic and contained large masses of round cells and lymphocytes. In the lens were masses of vesicular cells which appeared to correspond to the "blasenzellen" of Wedl. The band of fibrous tissue described crossing the anterior chamber, corresponded in appearance almost exactly to the one illustrated in Fig. 191 in Parson's *Pathology of the Eye*, Vol. i, Part I, p. 290.

Langdon's patient, a boy, aged thirteen, was seized ten days after pneumonia, with a severe pain in the left knee. Shortly afterward both hips, ankles, and wrists, were involved. He was admitted to the Orthopedic Hospital, with great stiffness of the joints, tenderness, bed-sores on his back, and a temperature varying between 99° to 102° F. Three weeks after admission he had a severe pain in O. D., with some ciliary injection, and a small gray node developed at the upper inner pupillary margin, 1 mm. in diameter. In

forty-eight hours it had tripled in size, and in another twenty-four had begun to send out streamers of soft gray exudate which in two days filled the entire upper inner quadrant of the anterior chamber. The general diagnosis had been thought to be either an aberrant form of tubercular infection or a low-grade purulent organism. The serum from a tapped joint was clear and gave no culture growth. On the third day of the ocular condition, 1/500 mgm. of T. R. was given with no effect, save the temperature then remained between 99° and 100° F. In forty-eight hours an injection of 1/300 mgm. was given and again no change except the temperature stayed between 99° and 99.5° F. Another joint yielded a cloudy fluid with no growth, even on dextrose-ascites-agar anaërobic stabs. Two sets of diplococci were found in a smear. A third T. R. (1/300 mgm.) was given, and after this there was noticeable absorption of the exudate, which in forty-eight hours had disappeared, leaving the node filling in the pupillary area. The iris did not dilate well under large doses of atropin, and the node had taken on a distinctly yellowish tinge, as though purulent, and light perception was lost. It seemed possible that the diplococci found were broken chains of streptococci.

GOUTY IRITIS.—Clarke believed that a point of strain or traumatism was the point for the manifestation of gout when it was in the system. If the metatarsal joint was defective, gout manifested itself there; if eyestrain were present, iritis would probably occur. He always tried correction of the latter before recommending iridectomy. Ormond asked whether rheu-

matic fever produced iritis at all? He also asked for a scientific definition of gout. He did not think it possible that errors of refraction and eyestrain could cause iritis. **Wessely** injected a sterile suspension of crystallin monosodic urat in physiologic salt solution into the cornea, under the conjunctiva, and into the anterior chamber, of rabbits. The monosodic salt was used for maintaining the analogy to human pathology, as not only the gout tophi but also the uric acid circulating in the blood consist of it. Injections into the cornea caused almost no irritation, and the crystals were absorbed or cast off in a few days, leaving a tender scar merely corresponding to the puncture. Injections under the conjunctiva produced violent hyperemia and chemosis for a few days, with gradual absorption of the urat without leaving greater disturbances. Microscopically a dense infiltration with leucocytes remained for a long time in the focus and the surrounding tissues of conjunctiva and sclera, followed later on by necrotic changes. In the majority of experiments the reaction after injections of from 0.5 to 1 cg. into the anterior chamber was comparatively slight. In some cases the aqueous was slightly opaque and the iris swollen, with a few posterior synechiae, which all disappeared after a few days. The opaque swelling of the corneal substance was attributed to the toxic action of sedimented urat at the posterior surface of the cornea. The opacity gradually disappeared under the development of blood vessels from the marginal loops.

Microscopically the deposit of urates is enveloped and permeated by coagula of fibrin, and there is an abundant immigration of leucocytes and numerous eosinophiles. Giant cells are found from 7 to 14 days later. The endothelium of Descemet's membrane at the extreme sinus shows proliferation and participates in the formation of numerous stratified flat cells, almost completely filling the space of Fontana. The parenchyma of the cornea is thickened to twice its size and infiltrated with leucocytes. After four weeks these macroscopic and microscopic

changes disappear almost completely, and a nearly normal condition remains for about a month. Then a gradually waxing opacity of the cornea develops in the area corresponding to the original site of the urates, due to necrotic processes. Descemet's membrane is separated into two lamellae, enclosing a coarse fibrillar new formed tissue. This vascular tissue is best characterized as pannus of the posterior surface of the cornea. In the third and fourth months minute glistening crystals develop in this tissue; which **Wessely** so far was not able to determine as urates, altho he thinks they are urates.

The interesting and important feature of the experiments lies in this late sedimentation of crystals and the slow necrotic process due to the very gradual and chronic poisonous action. According to **Wessely** there is scarcely another explanation but that the noxious agent remains during the whole time in some form fixed in the tissue, and it may be supposed to play a constant rôle in the slowly developing changes. He believes that his experiments bring us nearer to the conception that even without local sedimentation of uric crystals merely dissolved monosodic urat circulating in the body may evolve toxic effects on certain tissues of the eye.

**GNORRHEAL IRITIS.**—According to **Lang**, gonorrhea was not usually considered so potent a cause, but hospital practice would probably show a higher percentage than 12 in his 200 cases of iritis. Now, however, that the infection had been shown to linger in the genito-urinary system for years, relapses could be largely prevented by local treatment applied in that region. **Ormond** says an important point is as to the duration in an active stage of the gonococcus in the tissues; it had been asserted that it remained in the crypts of the prostate for 15 or more years, but that did not coincide with other statements.

**CHOROIDITIS.**—**Wallace** presented a patient, aged 20, with choroiditis, who noticed interference with vision four years ago. R. V. 7/10. L. V. 20/15. It is not progressing so far as vision is



concerned. Right eye: Temporal field involved from disc outward. Left eye: Superior and superior temporal fields diseased. Extreme superior patch of white very large and looks as if enameled or like a piece of china. One very interesting thing is the presence of a vitreous string between the disc and fovea, several millimeters long.

**Lang** says that at one time, syphilis was regarded as the chief cause of iritis and probably hospital figures would show an increase on his 6 per cent; but with the modern antisypilitic methods he thought it would become the rarest cause, for gummata of iris and ciliary body could be made to melt away without the disorganization of the eye which was formerly seen. In **Wallace's** patient, aged 25, with specific choroiditis, vision began to fail last August. Left eye became worse gradually, until three months ago, when the process increased. L. vision: Fingers at 12 feet. Wassermann plus 4. Fundus: Very extensive changes in all stages of the disease. Temporal field almost wholly involved, far up and far down. Nasal field and superior not so many points. Can see jet black and ivory white spots various sizes. At places pearly, shiny pinhead size spots. Across the superior field a very dim, almost indistinguishable line is seen, looks like a blood vessel but can see no junction with other vessels and lies in front of and at right angles to the arteries and veins. Probably 2 mm. wide and side outline more distinct, of pinkish white color and fades to an indistinguishable outline of other side.

**Holloway** exhibited a boy, aged thirteen, with disseminated choroiditis first seen March 13, 1916, at which time his eyes showed the following conditions: Vision R. 6/12. L. 6/15. In the right eye a few vitreous opacities, disc was pinkish yellow in tint. Studding the choroid were innumerable lesions, varying in size from a split pea to half the disc diameter. Many of these presented a grayish white, cottonlike appearance, and were surmounted centrally or eccentrically by a ring of pigment having an apparent diameter of about 4 mm., the circumference of the

lesion not being pigmented. In a few instances the pigmentation consisted of a solid clump about the same size as the rings. Some of the lesions were of a yellowish tint, and one near the macula was without pigmentation, whitish in color, and surrounded by a narrow yellowish areola. In a few instances the retinal vessels were partially covered by pigment. In the left eye there were a few vitreous opacities, with a low-grade neuritis, a diffuse superficial retino-choroiditis most perceptible in the macular region; and in the periphery there were a few vague choroidal foci without pigmentation. General examination revealed slight enlargement of the cervical lymph glands, some enlargement of the tonsils, and a suggestion of a rachitic rosary. Wassermann positive. **Holloway** stated that he had never seen a case before quite so striking. He believed the condition presented various stages of an active process depending upon hereditary lues.

**UVEAL TUBERCULOSIS.**—The tuberculosis cases of *iritis* of **Lang** (11%) were equally divided between the sexes, and the average age of the patients in this form was 25 years, all but two being between 16 and 35 years of age. According to **Koeppe** pathologic deposits are found on the posterior surface of the cornea in every case of iritis, whether tuberculous, serous, or in any other form. These deposits look like droplets, fibers, stars, or conglomerates. In the form with droplets the posterior surface of the cornea looks bedewed. It is probable that these droplets are insufficiently coagulated fibrin. They appear also in inflammation of other etiologies. The author has observed them, also, after the complete cure of an iritis. The fibers (filaments of fibrin) may be likened to picked cotton fibers. This is evidently a late stage of the droplets. The star form is very common. The substance is disposed in a manner reminding one of snow flakes. There is the impression that there is an additional moisture capable of crystallization. The amorphous conglomerates have a different aspect. These are like elevations on the

endothelium, often in the form of transparent nodules. After a certain time they are covered with very fine pigment particles like pulverized pepper. Their volume seems to grow by apposition, like the stars, and they reach varying sizes.

These forms show themselves in the course of different varieties and stages of tuberculosis of the iris, and in most cases even side by side. Thanks to the Nernst lamp the diagnosis of iritis can be made by the examination of the posterior surface of the cornea alone, at a period when this would have been impossible with the corneal microscope alone. The conglomerates and the nodules are, moreover, suspicious of tuberculosis.

Deposits are also observed, though less frequently, on the anterior lens capsule. These formations are much thinner than those on Descemet's membrane, often barely visible, or even absent. From a differential diagnostic standpoint they can be used even less than the other. In serous iritis they are always found in the aqueous humor. They are not of any importance from the point of differential diagnosis when searching for the etiology. They are composed of fibrin, cellular elements, pigment particles and sometimes erythrocytes. The visibility of light rays in the anterior chamber is a precious symptom of the existence of an intraocular pathologic modification.

**CHOROIDAL TUBERCULOSIS.**—**Jackson** presented a young woman who, until nineteen years of age, had vision of 20/20 in her right eye, which suddenly diminished to 5/200. Ophthalmoscopic examination showed a central chorioretinitis, with a large area of edema of the adjoining retina. The ophthalmologists, under whose care she then was, "were unable to determine any cause for the condition," altho careful clinical examination of her general condition was made, which did not, however, include tuberculin tests. She was given pilocarpin sweats, mercurial inunctions, and Donovan's solution. The patch in the macula went on to choroidal atrophy with pigment deposit. She was first

seen by Jackson eight months later. Vision in this eye was 4/45, with slight pallor of the outer quadrant of the optic disc, and choroidal atrophy 2/3 of a disc diameter in the macula, with a small pigment patch at the fovea. The left eye was and has remained normal.

The condition continued practically unchanged for 16 months. Then vision grew worse in the right eye. There was a noticeable extension of the scotoma downwards. Ten days later swelling and gray deposits to the nasal side of the old patch of choroidal atrophy were seen. There was some pain and pericorneal hyperemia, with rise of tension to 4 on the Gradle instrument (presumed pressure 60 mm.). Shortly before this, swelling and soreness had developed in the metatarso-phalangeal joint of the great toe. Tuberculin injections gave both general and focal reactions. Under tuberculin treatment the process subsided, the additional patch of choroid undergoing atrophy, the nasal larger portions of the lesion now seen in the macula. Vision reduced to R. 2/60 eccentric. There has been no evidence of fresh disease for more than 4 years. The patient was somewhat out of health when sent to Colorado, but has never given evidence of pulmonary tuberculosis.

**UVEAL LESIONS WITH VARIOUS GENERAL DISEASES.**—**Demaria** records two interesting cases of general uveitis in subjects affected with *vitiligo*, far enough advanced to render both patients blind. The first case occurred in a boy of 18. Wassermann and v. Pirquet negative. Injection of tuberculin caused marked general reaction as well as focal reaction in eye.

The second case, a woman of 45, in whom the tuberculin reaction was negative, but Wassermann positive. In the first case an iridectomy was performed on each eye without benefit, and the ocular condition did not respond to tuberculin. At present there is bare perception of light. The second case had iridectomy performed previously to coming under Demaria's care, tension is low and the eyes practically blind. Demaria discusses the



cases of ocular affections occurring in patients with vitiligo which have been reported by Erdmann, Gilbert and Komoto.

**Masuda** observed acute disseminated choroiditis with *scrofuloderma* in a 15-year-old scrofulous patient, who likewise had hemorrhagic nephritis. There was a suppurating lymphatic gland of the neck, which had partly cicatrized and had given rise to typical *scrofuloderma* in its neighborhood. Chemosis and swelling of the eyelids appeared on each eye, accompanied by dull pain. Ophthalmoscopic examination showed pale yellowish spots, more or less round, a few of which were of the size of the papilla. These spots were not accompanied by pigment and lay under the retinal vessels. They were more frequent in the equatorial zone, leaving the neighborhood of the papilla and macula free. The affection was more pronounced in R. than in L. It was interesting to note that the fundus disease appeared and proceeded with the swelling of the eyelids. The author thinks that this form of choroiditis has not yet been described.

**Marquez's** patient, a physician, complained of steaminess of vision, first noticed in the morning and persisting during the day. Three days later a sudden pain was felt in the eye. The pain subsequently disappeared but left the eyeball and surrounding parts very sensitive. The cloudiness of vision increased. *Malaria* being suspected, quinin was administered, with rapid disappearance of the symptoms. **Zimmer** describes bilateral metastatic cyclitis following an attack of *bubonic plague* in an Italian taken with sudden fever, a pustule in the right axilla, and loss of vision. Bacteriologic and clinical diagnoses demonstrated the plague. The eyes showed slightly increased tension, mild injection, posterior synechia, exudate in pupil, infiltrated vitreous so the fundus was not visible. Anterior chamber normal, and no visible nodes were seen. The patient was cured of the disease, but the blindness was permanent.

The 3 cases of *meningococcus irido-choroiditis* reported by **Lavergne** emphasize the necessity for watching over the

eyes during cerebrospinal meningitis, to detect ocular complications in their incipency. **Lavergne** insists that at the least suspicion of iridochoroiditis, ophthalmoscopic examination is imperative. The etiology of iridocyclitis has been discussed by **de Schweinitz**, with special reference to focal infections.

**SUBCHRONIC FEBRILE UVEO-PAROTITIS.**—A delicate, thin, anemic (hemoglobin about 75%) girl, aged 21, came to **Kuhlefeldt** on August 20, 1915. The father died of tuberculosis, but there were no other cases in the family. Lues could be excluded in both parents and patient. Parotitis epidemica as a child. In adolescence some affection of the fourth metacarpo-phalangeal joint of the right hand. Patient was not aware of having been in contact with anyone sickening from any illness. Since July, swelling and tenderness in each parotid region. Diminution of vision in the right eye August 15; August 18 last joint of left little finger, head and eyes painful. Feels tired. Has not noticed any symptoms of fever or of weakness or disturbances of taste or sensibility. Acute laryngo-bronchitis, but no demonstrable changes suggestive of tuberculosis. Apices alike and clear. Urine free from sugar and albumin. No symptoms of sinusitis.

Preauricular portion of each parotid right-retromaxillary portion nearly the size of an infant's hand, the left somewhat tender and uneven, pigeon-egg sized; surrounding parts not swollen. Nothing abnormal in mouth or throat. Sublingual, submaxillary and lacrimal glands neither tender nor swollen. No tenderness in the region of the ovaries.

Right ocular conjunctiva somewhat injected, small deposits on the lower part of Descemet's membrane, iris a little hyperemic. Media clear, papilla and retina over a wide circumpapillary area gray, turbid and swollen; blood vessels invisible at places; veins swollen and tortuous. Numerous large and smaller hemorrhages and gray patches in the inner and lower quadrant of the fundus. V. 5/10.

Left, normal condition. Last joint left little finger swollen and tender.

No demonstrable pareses. August 23. Pupil fairly well dilated by atropin, tho irregularly; iris swollen; exudation in pupil. No details of fundus visible. V. fingers 1.1 meter. Admitted to hospital. Aspirin, sweating, inunction. August 29. L. E. Pericorneal injection, some iris congestion. September 12. Left hospital. September 28. Right parotitis rather increased lately. Iritis gone. Collo-iodid and sweating. October 28. Papilla pale, papillary vessels in the main visible, surrounding retina normal in appearance, in the macular area there remain only the pigment patches, the formerly gray worm-shaped patch is white. V. fingers at 5 meters. Swelling in parotid glands markedly reduced. General conditions rather better. Collo-iodid discontinued and arsenic given.

The temperature has varied in the mornings between  $36.2^{\circ}$  and  $37.3^{\circ}$  C., and in the evenings between  $36.3^{\circ}$  and  $37.4^{\circ}$  C. There have been four definite rises of short duration, the maximum in the first being  $37.7^{\circ}$  C., in the second  $37.7^{\circ}$  C., in the third  $37.5^{\circ}$  C., and in the fourth  $37.9^{\circ}$  C. Possibly the first of these was connected with the iritis in the left eye, and the second with an exacerbation of the right-sided parotitis. The case occurred at a time when there were in the patient's neighborhood only isolated cases of epidemic parotitis. (In Helsingfors three in June, four in July, and not a single case in August were notified.) So far as is known, too, the disease was not transmitted to anyone else.

Mackay described a case of uveo-parotitis with *irido-cycloplegia* in a table-maid, aged 30. When first seen, March 10, 1916, she showed slight, diffuse, deep conjunctival and very moderate ciliary injection. The pupils were widely dilated (about 6 mm. in diameter) and immobile to light as well as on convergence, and tho appearing almost circular, a few posterior synechiae were found. Accommodation paralyzed. There were well marked punctate deposits on the back of both corneae, and haziness of the vitreous. Thru this fog the details of the fundus were rendered somewhat obscure, but

no gross changes were to be seen. R. V. 5/60 not improved by any lens. L. V. 6/60.

Two days after admission to hospital she developed bilateral swelling of the preauricular portions of her parotid glands. The cervical part of the parotids were less affected and no other glands in the neck were involved. The enlarged parotids were smooth, firm and only slightly painful on pressure or on yawning. Her temperature,  $98.2^{\circ}$  F. on admission, remained for the most part rather subnormal, varying from  $96.8^{\circ}$  F. in the morning to generally a degree more in the evening. The highest temperature was  $99.4^{\circ}$  F.—two days after a von Pirquet's cuti-reaction. Von Pirquet, Wassermann, and a subsequent injection of Koch's old tuberculin negative; no growth had been obtained from the blood culture; blood showed a leucocytosis; a culture from the conjunctiva showed Gram positive cocci (*staphylococcus albus* and *citreus*).

At the last examination, April 19, 1917, V=6/12 in each eye and Jaeger 1 more easily; pupils equal and almost circular, especially the left, about 5 mm. in width in subdued light, responded very little, if at all, even to brightly focused light, but definitely narrowed to about 3 mm. on convergence with accommodation. Some fine brown spots of deep punctate keratitis on both corneae, vitreous practically free from opacity; optic discs well defined, no visible choroidal changes even in the periphery of the fundus. Nothing abnormal was to be felt about the parotid glands; salivation appeared to be quite natural; the ciliary muscles had practically regained their power. On the whole she seemed in a fair way to make a complete recovery.

Mackay searched thru the *Index Medicus* from Heerfordt's communication of 1909 up to the present time, and found details of only six cases of dilated pupils and paralyzed accommodation recorded in association with parotitis. In three of these, the irido-cycloplegia appeared to be a secondary consequence of optic neuritis or optic atrophy, or as part of a third nerve



paralysis. Of the remaining three cases the first, published by Baas in 1886, had cycloplegia three weeks after mumps. Diphtheria was excluded. The second, reported by Mandonnet in 1903, was a child of 9, with complete paralysis of accommodation and of the soft palate after mumps. The third, recorded by Dopter in 1904, aged 31, two or three weeks after mumps which quickly subsided, developed pyrexia, occipital headache and double orchitis, left facial palsy, paresis of left half of tongue and soft palate, left mydriasis and left cycloplegia. He had definite leucocytosis and made a good recovery. In none of these cases was there iridocyclitis.

Mackay found no record of a case exactly reproducing either the group of symptoms or the order of their occurrence, which characterized the one under his observation. The ciliary body doubtless plays its part in endeavoring to get rid of deleterious substances circulating in the blood stream. It appears not improbable that the obstinate and tedious character which iridocyclitis so often presents is due to the fact that the morbid material passing from the ciliary gland into the aqueous fluid has no chance of being directly evacuated from the body like the saliva, but is necessarily reabsorbed into the circulation and sets out again in a vicious circle. It is commonly believed that in mumps the poison enters the parotid glands thru the buccal orifice. If that be so, it is easy to understand how the parotid gland reaction precedes other signs and symptoms of remote or metastatic inflammation or nerve pareses, which are presumably due to an extension of the poison thru the system, or are set up by toxins produced by the primary infecting agent. When remoter toxic effects precede the parotitis, the poison, whether due to mumps or not, may (or must) have entered by some portal other than Stenson's duct. The possibility of a mixed infection, e. g., with diphtheria, should not be put aside without further careful investigation.

**DIAGNOSIS OF UVEITIS.**—Thompson maintains that iritis is a local mani-

festation of a constitutional condition. In his experience the percentage of cases in which he could find no cause is very small indeed. If history or findings point to any focal infection in the sinuses or teeth, the patient is sent immediately to a roentgenologist for radiographic pictures. Always a Wassermann test is made, regardless of the history. When there is nasal discharge of any kind a specimen is sent to the laboratory for diagnosis; urine is always examined.

A mere cursory examination of the nasal fossae will, as Wynn emphasizes, often fail to reveal sinus disease that is causing the most severe focal symptoms. It must be most thorough and painstaking to be of any value, and Wynn found great help from the use of Dowling's tampons, which consist of a cotton tampon about 3 inches in length, soaked in argyrol 10 per cent solution, and placed in the middle meatus for about 15 to 30 minutes. If the sinus is affected there will be a free flow of muco-pus and the tampon will be discolored. In the discussion of Irons and Brown's paper, Rochester spoke of the great value of the suction apparatus in the diagnosis of these cases.

Levy calls attention to the fact that in all but one of his cases dental infection has been on the same side with the affected eye. He warns the ophthalmologist to satisfy himself that a careful roentgenographic examination has been made of all suspected teeth, before excluding them as a possible etiologic factor in infectious eye conditions.

While the complement fixation test for gonorrhea was formerly very unsatisfactory, giving positive results in only 5% of the cases, Fredrick says, the procedure has now been improved by the use of a great number of strains, as many as 150 in some places, so that today we can count on 85% efficiency. He gives the clinical histories of 3 cases from his practice illustrating the great aid the complement fixation test can afford one. Darier also attributes great importance to the complement deviation by means of the gonococcic antigen. The authors mentioned un-

der etiology express the same views with regard to diagnostic methods.

For the differential diagnosis of incipient iritis from simple conjunctivitis, **Darier** recommends instillation of adrenalin, or better cocarenalin, after which the superficial conjunctival hyperemia will disappear if it is a simple conjunctivitis. If it is an iritis, a deep and violet hyperemia will persist around the cornea. **Woods** considers the proper attitude of ophthalmologists to the use of tuberculin for diagnostic purposes: avoidance of focal reaction in ocular lesions; and a positive von Pirquet with elimination of other causes a sufficient diagnostic sign.

**TREATMENT OF UVEITIS.**—In iritis, accompanied by violent inflammatory phenomena, radiating pains, **Darier** recommends leeches, which **Ormond** also found very useful. **Ormond** said that great comfort was obtained by the continuous application of the electric coil. From the macroscopic and microscopic findings, in his experiments on the influence of radium emanation on the deposits of urates in the eye and the peritoneum, **Wessely** concludes that radium emanation even in high concentration, exceeding the usual clinical values, has no influence on the effect and the fate of urates deposited in the body. The removal of the septic foci in cases of iritis or focal choroiditis, e. g., in the dental regions, tonsils, etc., as the only rational treatment with brilliant results, was mentioned under etiology.

Not only a method of diagnosis but also the best form of local treatment in chronic affections of the sinus, if they are not operable, is, according to **Wynn**, the use of Dowling's tampons. The benefits obtained are due to the effects of induced capillary attraction, which drains the ethmoidal cells of retained secretions and depletes the turbid soft tissues. The immediate effects produced by the tampons are conjunctival congestion, sneezing and a flow of mucopus. **Rochester** thought the suction apparatus was of great aid, when it was necessary to use conservative methods.

**Dunn** considers vaccines in the earlier stages a valuable adjunct to our list of remedies in the treatment of secondary ocular inflammations. He used Mulford's mixed influenza serobacterins, which contains killed sensitized bacteria: *b. influenza*, *staphylococcus albus* and *aureus*, *streptococcus*, *pneumococcus*. In no case, however, did he fail to supplement their use with such general or local treatment as he thought the case required. In a case of toxic choroiditis secondary to a chronic alveolar abscess, **Rowe** felt that stock vaccines for mixed infections, after the teeth extraction, while they were begun late, were still in a measure responsible for the happy results obtained. **Darier** regards autovaccines in gonorrheism of precious therapeutic value, and **Fredrick** reports most brilliant results in 3 cases from the injection of mixed Neisser serobacterin.

To **Lang** the treatment of tuberculous iritis, as for tubercles of the lung, appeared to be good air, graduated exercise, and food rich in fats, as well as such local measures as would subdue inflammation and prevent closure of the pupil. **Woods** avoids tuberculin as a therapeutic measure in acute cases. Under "acute" there should be included duration and advance of the lesion, as indicated by condition of the vitreous, descemetitis, etc. Tuberculin is indicated when the trouble is nonprogressive, but does not get well. A positive von Pirquet, with elimination of other causes, is sufficient basis for the use of tuberculin in therapeutic doses. The present status of vaccin therapy is so uncertain, in the opinion of even those most expert and experienced, that ophthalmologists owe it to their patients to conduct this treatment under the guidance of one trained in "immunologic problems."

**Koeppé** recommends systematic treatment of the portions of iris attacked by tuberculosis with the Nernst lamp. It deserves to be adopted by everybody aside from the specific tuberculin treatment. The best cases for the treatment with the Nernst lamp are all of the nodular forms, and the localized changes in the iris, as, also, the



cases of pure serous iritis without decided changes in the iris tissue. The technic is described and the literature on the subject is given.

**Lavergne** urges that if the diagnosis of irido-choroiditis in cerebro-spinal meningitis is positive, antimeningococcus serum should be injected immediately into the vitreous body. This is the only treatment known to date, he reiterates, that has realized unmistakable benefit. In the three cases here described it came too late to save vision in the affected eye in one child of 11 months; the second child, 13 months old, died, and the third, 5 years old, was left with much impaired vision in the affected eye. **Mann** recommends subconjunctival injections of a 1 to 2,000 solution of cyanid of mercury (20 drops), and is convinced, that in a case of virulent irido-cyclitis, with high tension and occlusion of pupil, of unknown source of infection, without these injections the eye would have been lost.

**ATROPHY OF IRIS.**—According to **Lane**, primary progressive atrophy of the iris, with almost complete loss of all the iris stroma, is a comparatively rare condition. Atrophy of a portion of the iris due to a specific or tubercular lesion, to an injury or an increased intraocular tension, is not uncommon. After careful search of the literature only twelve cases appear to have been reported. Lane's patient, a well-developed young woman of Bohemian descent, single, aged 20, has been under observation since October, 1915. Her parents, one brother and two sisters, are living and well. A brother died of tuberculosis in infancy, and two sisters have died of the same disease. Five other sisters died in infancy; the patient does not know the cause of death. The patient's general health has been good. She has had a few of the minor diseases of childhood; menstruation regular. When 13 years of age a facial acne vulgaris indurata of a very persistent type developed. The face is deeply scarred, and numerous hard indurated masses are now present. There is no history of injury. The patient is not of a nervous temperament.

Two years ago she noticed the iris of the left eye had a small black hole in the margin of the pupil, which extended downward into the colored part. Shortly afterward another hole appeared which extended toward the temporal side of the eye. At times the eye became inflamed. This would last for several weeks. There was little pain at this time, and never any secretion. Gradually other portions of the iris began to retract and disappear, until the pupil had the appearance of a rectangle. The only iris left was four small bands. The eye became more painful and the vessels injected. About one year ago the patient noticed the eyeball was smaller than the right eye. Vision was poor, at times worse than at other times. During the past months a film had gradually appeared on the cornea. The patient has been nauseated lately and during the past two weeks the pain has interfered with sleep.

A distinct glaucomatous cloudiness of the cornea exists. The ball is considerably smaller than the other one. Ciliary vessels are deeply injected. Vision: R. = 6/30; L. = fingers at six inches. Plus 2.00 cyl. ax. 90° gives 6/7 in R. Tension: R. 22, L. 56. Blood pressure, 115. Slight red reflex, but fundus cannot be made out. Good transillumination of each ball. The iris is almost completely absorbed. A small almost invisible band exists above and to the nasal side; the iris tissue at the temporal and lower quadrants is only slightly more abundant. None of the bands of iris tissue join each other at any point.

The right iris apparently normal. Tuberculin and Wassermann tests negative. The acne seems to be the only condition at all suggestive of a possible focus of infection. Dionin and physostigmin salicylat and treatment for the acne was instituted. In ten days the tension greatly improved, the cloudiness of the cornea was better. Vision: R. = 6/20. L. = 1/60. No pain or nausea.

Late in January, 1916, the tension suddenly rose and the eye became painful. A trephining operation was done. There was considerable difficulty in

dissecting the flap and bleeding was troublesome. A clean disc was removed. No iris appeared in the trephine hole, nor was it possible to draw it up into the opening with forceps. A stab opening was made and the aqueous squirted about four inches above the patient's face, so great was the intra-ocular pressure. The cornea at once became soft. An attempt was made to draw up the iris, but this was only partially successful as the iris was firmly adherent. The eye healed rapidly, the cornea losing its haziness, so the fundus could be indistinctly seen in a week following the operation, when the patient left the hospital. V.=5/60. A large bleb remained over the trephine hole and the filtration was good.

In a month the ball was larger, the cornea was practically clear, no injection of the vessels. Tension 20. November, 1916, the eye was clear, only a pin point haze over the center of the cornea remaining. The bleb was much smaller and the hole not easily made out. However, there was still some filtration. V.=3/60. The fundus could be fairly well made out, some cupping, tension 28. The patient occasionally used eserine or dionin if the eye did not feel good. This always gave relief. Absorption of the iris was still going on; less was visible than on her last visit. In December the eye was still clear, and the difference in the size of the two was not now apparent. Only a trace of iris remained above, and a faint line below and to the temporal side. In February, 1917, the patient reported with the right eye troubling for the previous two weeks. The pupil was partially dilated and somewhat sluggish. Slight conjunctival injection, left eye clear. Vision: R.=6/30, with correction =6/10 minus. L.=3/60. Patient is dizzy, nauseated, and has severe headache. No cupping of disc. The media are not perfectly clear. Tension 30. Physostigmin gave prompt relief, improvement in vision and in symptoms being rapid. The acne has not responded to treatment. Vaccines have been used. At times it is better. Various tests have not re-

vealed anything to show the cause of the disappearance of the iris.

In the reports of de Schweinitz, Harms, Wood, Zentmayer, and in this patient, increased tension has been found. No one yet has been able to show a definite primary cause for essential primary atrophy of the iris. Men and women are each subject to the condition. The period of twenty to forty has furnished the most of the cases. Previous history of injury was found in at least four of the cases, but undoubtedly could not be called a possible causal factor of great importance. Nervous tissue degeneration may be a factor, as in Dupuy-Dutemps' report of atrophy of the iris in *tabes dorsalis*. Latent tuberculosis was undoubtedly present in several of the patients of those reporting atrophy of the iris.

Autotoxemia could be a factor. The acne which this patient has had for years is probably of this origin, as diet and eliminative treatment seem to produce a slight improvement.

Lane hopes that some one may see this condition when it is beginning and make an exhaustive study. Many cases of partial atrophy of the iris, or arrested condition of loss of iris tissue, have been reported. But only a few go on to complete absorption of all the iris stroma and loss of vision. All the cases reported show more or less loss of vision. The question arises, will the other eye become involved in a similar process? As yet no report has shown this to have happened. Increased tension has been present in nearly all the patients reported. It appears that there may be some disturbance of the bodily metabolism which exerts marked action on the eye tissue, causing the increase of tension.

**ATROPHY OF CHOROID.**—Chance exhibited a case of extensive atrophy of the *choroid* in a man of about 70, who has been in good health. Wassermann negative. There has been nothing in his business that would give rise to such atrophy. Here and there, large surfaces of the sclera are seen. There is but little secondary pigmentation. The macular region is intact. V.=6/30.



The appearances in **Jackson's** case supported the view of Stock and others that a large part of cases of choroidal atrophy are due to tuberculosis.

**OSSIFICATION OF THE CHOROID.**—**Monbron** reports a series of 5 cases with histoanatomic examination of the

specimens, and a general review of the subject with a bibliography. He concludes contrary to the opinion generally received that only the choroid and more exactly the choriocapillaris is the starting point for intraocular ossification.

## SYMPATHETIC DISEASES

HANS BARKAN, M. D.

SAN FRANCISCO.

A review of the literature relating to sympathetic diseases of the eye appearing during 1917 and to February 1st, 1918. Allied topics are reviewed in the section on the Uveal Tract, or will be taken up in the section on Injuries.

**OCULAR ANAPHYLAXIS.**—**Woods** refers to the mycotic theory, as to the pathogenesis of sympathetic ophthalmia, advocated by Roemer and Fuchs, to the cytotoxic theory of Golowin; and to the theory of Elschmig, who assumed sympathetic ophthalmia to be an anaphylactic uveitis. In order to determine the fundamental points of the anaphylactic theory, the author endeavored to test the following: 1. The antigenic properties of homologous uvea-organ specificity. 2. The ability of one eye to react to perfusion in animals previously sensitized by intraocular injection of the other eye. 3. What constituent of the uveal tract is responsible for such antigenic properties as are possessed by homologous uvea.

The technic of his experiments is given, and a summary of his results. He concludes as follows: 1. Homologous uvea has the power of acting as antigen, and producing an ocular hypersensitiveness. 2. Homologous uvea possesses a strong specificity. 3. Intraocular injection of a small amount of either homologous or heterologous uveal emulsion can produce a hypersensitiveness in the second eye. 4. From the evidence at hand, it seems probable that the peculiar antigen properties of uveal emulsion are due to the pigment epithelium. A bibliography is added.

The anaphylactic theory of sympathetic ophthalmia has also been fully

discussed by **Schieck**, who questions whether the theory propounded by Elschmig is at all clinically applicable, or meets with important objections, so that it must be repudiated. Elschmig advanced the hypothesis, that sympathetic ophthalmia is an expression of local anaphylaxis, utilizing Bail's theory. Bail's theory says that by antigenous resorption of injured uveal tissue an over-sensitiveness is produced in the organism, especially the homologous organ, viz., the second eye.

As in von Pirquet's experiments inflammations occur in consequence of increased capability of reaction through introduction of the anaphylactogen from outside, in our case an inflammation would have to arise, with the serious sequelae due to the vulnerability of the organ, by the least disturbance in the over-sensitive eye, by the disintegration of even one uveal cell or pigment epithelium.

Schieck points out, that for applying this assumption to the clinical facts it must be proven: 1. That the uvea contains an organ-specific, anaphylactogenous albumin, which is absorbed as antigen; 2, whether an organism produces antibodies against its own, although serum-heterogenous, albumin, and whether it can be sensitized against its own products, in other words, whether an autoanaphylaxis exists; 3, how a spontaneous disintegration of uveal cells occurs in the second eye and

how the introduction of the anaphylactogen takes place locally; 4, the main point is that the clinical facts must be brought in accord with the essence of anaphylaxis.

Leaving the first three points aside, Schieck considers the course and peculiarities of the disease as such and whether they fit into the established scheme of anaphylaxis. He emphasizes that the protective effect of enucleation has not been sufficiently considered in judging the validity of the anaphylactic theory. Zade showed experimentally that the anaphylactogen from the eye after injection of the antigen into the anterior chamber is communicated to the whole organism after three hours. Perhaps the sensibilization of the body occurs even earlier. What good, then, Schieck asks, can removal of the injured eye do, if in the meantime uveal pigment, in a form acting as antigen, has entered the circulation, and the process of sensibilization takes place outside of the eye in the vascular system or the bone marrow, and, at the latest 14 days afterwards, the organism contains the dreaded anaphylactogenous antibodies against uveal pigment, and the least anomaly in the other eye may elicit the reactive process? If sympathetic ophthalmia were a process of anaphylactic reaction, all our prophylaxis would be in vain and the other eye even after preventive enucleation of the injured eye would be endangered for weeks, occasionally for years or for the whole life. Since fortunately this is not the case, sympathetic ophthalmia can have nothing to do with a sensibilization against uveal pigment, and the theory must fall. The certain protective effect of enucleation is not conceivable if the anaphylactic theory is accepted. In that respect bilateral idiopathic iritis and parenchymatous keratitis, which as a rule also occurs in both eyes, are generally entirely different from sympathetic ophthalmia.

**PATHOGENESIS OF SYMPATHETIC OPHTHALMITIS.**—**Van Schevensteen** refers again to the early theory of sympathetic ophthalmia by noting in several cases an early papilloretinitis with fine vitreous opacities, and he has seen these

repeatedly when the sympathizing eye has been observed carefully during the entire course of the affection of the originally injured one.

While all investigators agree that the typical anatomic picture as described by Fuchs is pathognomonic of sympathetic ophthalmia, **Morax** has gone even further and in a very careful pathologic study, in which he was assisted by Landolt, shows that this process takes place in a different fashion, according as to whether the wound of entry is in the anterior portion of the ball (especially in the region of the ciliary body), or as to whether the inciting foreign body or injury is located in the posterior part of the ball. The sympathetic ophthalmia set up by the latter injury he considers a great rarity. The lesions caused by either one of these two localizations as regards injury are nodular infiltrations of the choroid and of the subchoroidal space by lymphocytes. They vary, however, in that those caused by anterior trauma, are inclined to give rise to greater infiltration in the deep ciliary layers; whereas those in the posterior part cause a rather marked infiltration about the entrance of the optic nerve.

**CLINICAL REPORTS.**—**Brown** reports an unusual case of sympathetic inflammation developing in the fellow eye in the eleventh week, in which the picture (noted a few times before), of depigmentation of the cilia of all four lids was quite marked. This might be ascribed to a pigment antigen. Section of the primary eye showed typical findings.

In two cases reported by **Russ Wood** injections of old tuberculin were given and were followed in each case by a marked focal reaction in the sympathizing eye. But no such reaction occurred in the primarily injured or exciting eye. In neither case was the use of the tuberculin followed by any apparent benefit. In both cases injections of salvarsan had been used without benefit, and after the tuberculin injections steady deterioration of vision continued. This author suggests the possibility that sympathetic ophthalmitis may be due to symbiosis, there



being a cooperation between the tubercle bacillus and some unknown protozoan.

**Darling** reports two clinical cases of sympathetic ophthalmia. In the first, while examination and history were significant, there was on anatomic examination, no sign of typical sympathetic disease, but a degenerated eyeball with bone formation. The second case is remarkable by the fact that there was at no time a keratitis punctata of the sympathizing eye, although in every other respect it showed the classical picture.

**PROPHYLAXIS.**—Prevention, and the reasons why sympathetic ophthalmia is relatively rare in the present war, in spite of many ocular injuries, have been extensively discussed by **Weekers** who, in upward of 800 eye injuries, has not met with a single case, and he contrasts this state of affairs with that of former wars, where the disease was common. In order to show the danger in times of peace, he points to the statistics of **Ohleman** who found sympathetic ophthalmitis in 0.7 per cent.; **Knies**, 3 per cent. in wounds of the eye; and **Hobby**, 11.6 per cent.; after removal of cataract. **Everbush** had 1.3 per cent; **Agnew** 2 per cent; and **Steffan** no less than 21 per cent.

**Dimmer** also comments on the rarity of sympathetic ophthalmia following war injuries, and thinks the difference between the percentage and that seen in times of peace is worthy of investigation.

In order to prevent its occurrence, **Weekers** urges waiting for at least a few days before enucleation whenever the wound is such as to allow of the hope that the eyeball will keep its shape. He maintains, however, that the classical dictum of removing the eye if it remains painful and irritable for a month or six weeks after the injury should be followed, and not even to wait as long as this if the globe appears to be on the way to atrophy, or if exudative iridocyclitis develops in the injured eye. He is inclined to ascribe the rarity of sympathetic ophthalmia nowadays to the asepsis and antisepsis which are now so general, adding that

when operators will take as many precautions before opening an eye as for a laparotomy, postoperative sympathetic ophthalmia will very nearly disappear.

As is quite natural, in these times of attention to treatment, there is not as much time to devote to questions of etiology. A great deal has been written on treatment of cases of sympathetic ophthalmia. **Weekers** maintains that the early removal of the wounded eye, even though lost as to function, is not justified as a prophylactic measure against sympathetic ophthalmia. There is no urgency for such removal for several days, especially as the danger of sympathetic disease seems to be diminishing; he urges temporizing, as delay may enable us to save eyes that at first sight seem doomed to enucleation.

When radical operation on the wounded eye is necessary, **Weekers** gives the preference to evisceration, believing it to be as good a guarantee as enucleation in regard to the development of disease in the second eye, and for it he claims far superior results as regards prosthesis. This view is not shared by **Orlow**, who maintains that neither one nor the other is an absolute preventive, and that of the two enucleation is decidedly the more so. He has seen some cases develop in spite of these procedures, and advises caution as regards the definite statement to the injured man that the second eye will surely be saved by these operations.

**Verwey** has written a most interesting paper on the conservative treatment of an injured eye suspected of possibly becoming the exciting agent of a sympathetic ophthalmia. He excises whatever may have prolapsed thru the wound of entry, dissects the conjunctiva off the limbus, and performs a tobacco pouch suture, a proceeding which is simple and effective. The patients generally do not have to lie down and the injured eye stays fairly tranquil. He believes that this procedure does not militate against any sight which the eye otherwise might have kept if the procedure had not been adopted. He has performed it in eight

cases of lacerations of the cornea; four cases of lacerations of the sclera; and in twelve cases of combined lacerations. A fair degree of vision was maintained in seven of the above. In one case the cornea and sclera had been widely lacerated, almost the entire iris had prolapsed, including the ciliary body, vitreous and lens. These were excised, and a tobacco-pouch suture applied to the conjunctiva. Twenty-four hours afterward, the uninjured eye showed slight iritis, which was controlled with atropin. He has enucleated the injured eye in a number of cases about 32 days after the accident, when the iritis of the second eye was just commencing and was well controlled with atropin and the administration of sublimat by mouth. In all these cases the sympathizing eye recovered very promptly.

**TREATMENT OF SYMPATHETIC OPHTHALMITIS.**—**Brown** has noticed a marked improvement in the course of the sympathizing eye with the use of mercury and benzosalin, combined with a tuberculin course. This improvement, however, was not very rapid until the infected tonsils in the case were removed, when vision cleared up to 4/10 and has remained this acute for 14 months. **Darling** also has seen improvement of the sympathizing eye follow almost immediately after removal of the tonsils, although in his case the vision fell again five days later to 20/200.

Wilder, in discussion of Brown's paper, maintains that operation in cases of increased tension in the course of sympathetic ophthalmia is something that should be refrained from if at all possible. He thinks it is a point which is well worth considering in connection with any case of sympathetic ophthalmia in any stage, for the reason that the inexperienced ophthalmologist, who had not seen a number of these cases through long periods of time, might easily be tempted too early to operative interference. If there is any one thing in connection with the treatment of these important cases which should be emphasized, it is to absolutely refrain from operative interference even

months and months after the subsidence of the last symptom. He thinks the most that might be done would be paracentesis, which might be accomplished with safety; but if there is anything brought home to him in the treatment of this disease, it is that one should not jump in "where angels fear to tread." He is convinced that no operation should be attempted for restoration of the vision until two or three years after the subsidence of all symptoms.

**SYMPATHETIC DISEASES OTHER THAN OPHTHALMITIS.**—The terminology "sympathetic irritation," "sympathetic amblyopia" and "sympathetic ophthalmitis" is, according to **Cousin**, one which should be adhered to strictly, and which has in each instance a definite reason for existence. He believes that there exists a group of signs, which cannot be accurately described as sympathetic ophthalmitis, but which should be carefully differentiated from sympathetic irritation. He terms this group that of "sympathetic reaction," and claims that it occurs every frequently among the wounded of the French Army.

In the wounded eye the symptoms are pain, tenderness on pressure, lacrimation, conjunctival injection. Photophobia is a less constant symptom. These symptoms date usually from the time of the injury, which in most cases is a perforating wound, and persist after cicatrization is complete. The pain is usually persistent, although not severe, and is occasionally liable to short exacerbations. Pain and tenderness have never been absent from the cases under the author's observation. Lacrimation and conjunctival injection vary greatly in degree.

In the unwounded eye, the symptoms present considerable resemblance to those already described, but are, as a rule, less marked. Their onset is later; in some instances 36 to 48 hours, but more commonly seven to ten days after the injury. The writer mentions four symptoms as characteristic: photophobia, lacrimation, discomfort in reading, slight lowering of visual acuity. Photophobia is the most frequent symptom, and is usually well-marked,



but relieved by the use of tinted glasses. Lacrimation is of very variable intensity. Discomfort induced by reading, or by any occupation requiring accurate and prolonged use of the eye, is often the symptom which leads the patient to seek advice.

The loss in visual acuity, always slight, is difficult to estimate accurately; in most cases no record of the vision before the accident is obtainable. Cousin states that he has found a reduction in acuity varying from 1/10 to 5/10. Ophthalmoscopic signs are negative; pain is absent. These symptoms, while resistant to ameliorative treatment, all disappear shortly after removal of the wounded eye; the defect in vision being the most tardy. Enucleation of the wounded eye is the treatment recommended. Notes of eight cases are included in the paper.

**Shoemaker** and **Alt** report a case which can very well be referred to in relation to the type of cases described above by Cousin. The diagnosis of sympathetic ophthalmia was made, the injured eye having lost the sight 13 years before, after injury with a pair of scissors. While the blind eye was not giving any discomfort, the wound on

the limbus and the sympathizing eye had shown for the last four days a severe neuro-retinitis, with a few small exudates in the retina and minute hemorrhages. The positive diagnosis of sympathetic ophthalmia did not seem justified, especially as Sluder reported a left hyperplastic and a right purulent sphenoiditis. It was agreed, however, as the injured eye was blind, to remove the same. Mercurial inunctions were continued, but though there was marked improvement, the neuro-retinitis persisted. The examination of the removed eye showed simply the results of a severe infectious inflammatory process following the original injury. The peculiar signs given by Fuchs as characteristic of sympathetic ophthalmia were altogether wanting.

In this case, as undoubtedly in many seen in practice in which the diagnosis of sympathetic ophthalmia is made, the chances are that the case is much more likely to fall into the classification described by Cousin as sympathetic reaction, and more of the enucleated eyes examined in the laboratory would show a freedom from the specific changes described by Fuchs.

## GLAUCOMA.

JOHN ALEXANDER McCaw, M. D., Oph. D.

DENVER, COLO.

A digest of the literature relating to intraocular tension and glaucoma for the year 1917 and until March 1st, 1918. Some related subjects will be found mentioned under Diagnosis and Injuries.

**ANATOMY OF THE FILTRATION CHANNELS.**—**Maggiore** concludes that the canal of Schlemm in man is a vascular structure; that the canal is joined to a closed vascular plexus formed of numerous veins with a few arterial twigs. The connections between that plexus and the canal are formed by a small number of collecting trunks, about 20 or 30 in number, with very small lumens. He found that there was no connection between the canal and the anterior chamber, and that the canal had a complete endothelial lining. Under normal conditions the canal contains only lymph.

**PHYSIOLOGY.**—**Magitot's** work on physiologic intraocular pressure concludes as follows: That, (1) the normal intraocular pressure in man oscillates between 15 mm. and 25 mm. Hg.; (2) the pressure varies along with arterial pressure; (3) the factors influencing pressure are the general and local blood circulation, and the walls of the eye; (4) the eyeball is distensible in the adult due to elastic fibers in the sclera; (5) the uveal tract is an erectile tissue, a blood reservoir, which regulates the pressure; (6) the variations of pressure within the normal limits are due chiefly to variations

in the general arterial pressure; (7) variations of the general blood pressure are accompanied by more decided hypotensions than hypertensions; (8) the pressure is more subject to variations of the local circulation than to those of the general circulation; (9) among ocular nerves, the cervical sympathetic or its ganglia are alone capable of influencing the pressure of the eye.

The sympathetic centers capable of altering pressure are: (a) Bulbo-medullary, action dilation; (b) cervical and cephalic, mostly constriction; (c) the ocular, action variable. The last is the real regulating organ. The aqueous has no influence on pressure except in conditions which lead to rapid secretion of the aqueous, when albuminous substances make their appearance and alter the pressure. If collyria have any influence on the pressure of the normal eye, they have it through the action of these drugs on the diameter of the vessels of the uveal tract. The intraocular pressure is solely under the influence of the ocular vessels, and these vessels are regulated by their nerves.

The uncompleted studies of **Priestley Smith**, upon the blood pressure in the eye and its relation to the chamber pressure, have, so far as yet published, dealt only with the mechanical factors that influence blood pressure in general, by a discussion of the relation of main trunks to capillaries in the blood stream as a whole.

**HYPOTONY.**—**Collins** classifies the sequels of hypotony. 1. Those due to relaxation of tissues usually kept taut: (a) wrinkling of the anterior lamina of the cornea; (b) wrinkling of posterior lamina of cornea and the layers of the substantia propria immediately adjacent to it; (c) thickening of the sclerotic coat; (d) wrinkling of the elastic lamina of the choroid, and the heaping up of the pigment epithelium on its inner surface where the folds are deep; and (e) the displacement forward of the lens and slackening of the suspensory ligament, both of which tend to increase the refraction of the eye. 2. Those due to production of relatively higher blood pressure compared to intraocular pressure that ex-

ists under normal conditions: (a) In the choroidal veins, the normal excretion of lymph through them is arrested and instead, an exudation of lymph takes place, giving rise to detachment of the ciliary body and choroid; (b) in the veins of the iris, the normal excretion of the aqueous humor thru them is arrested, and instead, an exudation of lymph into the anterior chamber takes place; (c) in the capillary vessels of the ciliary body, the secreting function of that structure is quickened, and an exudation of lymph takes place, the albuminous constituents of which raise vesicles in the epithelial lining of the parts; (d) in the capillary vessels of the choroid, the normal exudation of the lymph is stimulated, which if it permeates the pigment epithelium may collect beneath the retina, causing detachment; (e) in the retinal vessels of the optic disc, the normal excretion of fluid from the vitreous is arrested, and an exudate of lymph into the disc takes place, giving rise to the appearance of choked disc.

**Elliott**, in discussion, pointed out that a condition of hypotony might exist for years in patients who had undergone sclero-corneal trephining, without any evidence that the eyes had suffered thereby. He had been able to keep in touch with cases for six years, and was able to say it did not necessarily cause opacities of the lens, and it was a question whether it ever did. He agreed as to the transitory tendency towards myopia after trephining. He had seen as much as 2.50 diopters of myopia within two weeks of the procedure. As the flap consolidated, the chamber deepened, the lens receded, and the myopia disappeared.

**Van Hoorn** in studying the influence of miotics and mydriatics on intraocular pressure, finds that after use of pilocarpin, there is slight hypotony, a very slight rise after the use of eserine, homatropin, scopolamine and atropine. Then-tension is greatly increased after instilling a solution of 5 parts of cocaine to the 100 parts and 2 parts to the 100 of holocain or alpin.

*(Continued next month)*



# DIGEST OF THE LITERATURE.

## GLAUCOMA.

JOHN ALEXANDER McCaw, M. D., Oph. D.

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*(Continued from April issue)*

**Gunnufson** found tension during sleep was always materially lowered. Three factors come into play for this reduction of tension: The reduction of blood pressure; miosis during sleep, marked in children, and decrease of secretion.

**TONOMETRY.**—**Jackson** says the tonometer of Schiötz measures the depth of an indentation of the eyeball, produced by a given weight applied to the center of the cornea through a steel rod. The depth of the indentation made by the rod varies with the intraocular pressure, and with the curvature, rigidity and thickness of the cornea. When the corneal plate or base of the tonometer is flatter than the cornea, or when the corneal radius of curvature is greater than the radius of curvature of the tonometer base, you get a reading that may vary materially from that indicative of the real intraocular pressure. This variation may amount to from 5 mm. to 12 mm. of mercury. Jackson used the ophthalmometer to measure the radius of corneal curvature, to show the degree of corneal asymmetry and the presence of irregularities of the surface in a series of eyes. In the 2,000 eyes tabulated, the difference in radius of curvature in the two principal meridians amounted in some cases to more than 2 mm. It will be a step toward the solution of important clinical problems if we frankly admit that the significance of increased hardness of the eyeball, whether perceived by fingers or tonometer, is still very imperfectly understood.

The most important limitation on the practical value of the tonometer, however, is that it gives readings from

which high intraocular tension and glaucoma would be inferred, when the disease glaucoma, or any special tendency to it, is entirely absent, as the rise of tension following discission of a crystalline lens or rise following operation for secondary cataract.

**HYDROPTHALMOS.**—**Becker** reviewed the literature on the etiology of buphthalmos and concluded that the condition was due to a developmental defect. He reported a case in a girl five and a half years of age. The special feature in the case was that the hydrophthalmos was unilateral. Vision, R. and L., hand movements at two feet. The patient was normal physically and mentally. The family history was negative. The patient was delivered with forceps after prolonged labor, one blade being over the root of the nose, the left eye and left frontal region. This procedure did not produce any apparent injury to the globe. At birth the left eye appeared larger than the right, and gradual enlargement has since taken place, so that the cornea measures 18 to 19 mm. The pupil is 8 mm., and irresponsive to light. Centrally, the cornea is quite thick, with good curvature, but is thinned towards the limbus. There is no equatorial or posterior staphyloma. The zonule of Zinn is elongated. The iris is moderately thinned and tremulous. The media are clear, the disc is oval 6 by 8 mm. The optic disc shows advanced atrophy. Reber and Heckel were in agreement with the author in the theory of causation.

**Risley** presented a girl of seven years with photophobia and lachrimation in the left eye. The right eye was normal. The tension in the left eye was

57 mm. The sclera was distended, with engorgement of anterior ciliary vessels. There was no pain nor headache. The condition had come on within three weeks. There was a dendritic break in the epithelium and a descemetitis. The ophthalmoscope showed a deep glaucomatous cup and a choroidal disturbance, increasing in severity at the periphery of the field. Two days later, the photophobia had disappeared, the epithelial break was diminished, while above it, there appeared striae in Descemet's membrane. The ciliary engorgement improved and the tension dropped to normal.

**Ellett's** case was that of a three months' old negro baby. The corneas were hazy and enlarged. The eyeballs appeared to be larger than normal. The tension after operation was R., 40 mm., L. 100 mm. (McLean). Stanford operated on the left eye three weeks after the operation on the right eye. Five months afterwards, the child was placed on mercurial inunctions. The eyegrounds are now visible. No cupping of the discs. The tension is normal to fingers. Apparently the disease has made no progress in eight months.

**Weeks** presented an eye with buphthalmos, removed from a child of four months. The eye had enlarged as a result of complete annular posterior synechia and secondary glaucoma. The tension was increased. Intrauterine inflammation was regarded as the cause of the condition. The right eye in **Zentmayer's** case was soft and blind. The left eye could see shadows, and the tension was very hard. He considers the hypotension of the right eye was due to rupture of the sclera from a blow. Injections of tuberculin and phylacogen in **Ziegler's** case gave improvement.

**Claiborne** trephined the left eye in a child 12 years of age with buphthalmos. Following the operation, the tension was reduced, and the eyeball became much smaller. But following this, there was a gradual softening and shrinkage of the eye. The right eye was very much enlarged, with great increase of tension, but with some vision.

**Schirmer** advised repeated anterior sclerotomies. **Weeks** suggested trying anterior sclerotomy first, and if that failed, to trephine. He also advised the removal of the left eye. **Weidler** advised removal of the left eye as preventive of sympathetic ophthalmia in the right eye.

**Virden** showed a case of buphthalmos in a child 15 months old. He had first seen the child when it was a month old. At this time, the eyes were so large that the lids could not be closed. When the child was five weeks old, Virden trephined the right eye posterior to the ciliary body. This operation was done on the left eye when the child was twelve weeks old. Both eyes were reduced in size, the tension became normal, and the child could see objects. At the time of operation, there was no clear cornea, it was impossible to tell where sclera and cornea began. Virden advised in these cases that all trephining should be back of the ciliary body. **Schirmer** said that the vitreous chamber should never be opened when it could be avoided, on account of infection and degeneration of the vitreous. **Wheeler** remarked that scleral trephining had been abandoned in these cases, because the tension did not remain reduced.

**Seefelder**, after study of a recent case, thinks that the enlargement of both eyes in hydrophthalmos may be due, not to a process of stretching, but to an abnormal degree of growth.

**Grimsdale's** patient was 14 years of age. She had always had large eyes and defective vision. Her vision was fingers with difficulty. There is a deep cupping of the optic disc in both eyes. The retinal arteries are larger than the veins and are tortuous. They have a broad light streak and appear to be flattened. The veins are normal. The condition of the arteries is somewhat similar to that of the cases of retinal angioma, but he has not found any mass to which the vessels run. He regards the case as allied to cases of angiomata.

**ETIOLOGY.**—**Koepp** examined 50 cases of glaucoma with the Gullstrand lamp of high magnifying power. In 40



of these cases, he found more or less complete destruction of the pigment epithelium. He advances, therefore, a theory of the etiology of acute glaucoma. In consequence of trophic disturbance or a congenital weakness, a slow but irresistible morphological and a biologic cell destruction begins in the hitherto intact pigment epithelium, as well as in its derivatives in the iris and in part in the ciliary body. Free pigment globules and dust which has undergone a certain chemical change, and therefore become toxic, may possibly occlude the lymph passages and spaces, particularly the perivascular ones of the iris, chiefly at their openings. Also, this may lead perhaps to a contraction and gradual obliteration of the lumen and walls, with the result that the stroma of the iris is affected by a slowly advancing atrophy. This is brought about by a gradual decompensation of the circulation of the lymph, lymphatic engorgement, and the picture of lymphatic glaucoma. Through involvement of the walls of the smallest capillaries and veins, this may develop into hemostatic glaucoma. If the blood pressure is increased suddenly through the sympathetic, the result is an acute attack of glaucoma.

**Weeks** reported three cases of acute glaucoma associated with herpes zoster frontalis. The glaucoma developed two weeks after the onset of the herpes. The vision was reduced. The hypertension in all three cases was in the eye on the same side as the herpes. The explanation of the hypertension might be found in an abnormal amount of fibrin contained in the aqueous, thus leading to a blocking of the spaces of Fontana. The cases had shown no previous symptoms of glaucoma.

**Thomas** includes focal infection, syphilis and hydrophilic colloids in the etiology of glaucoma. **Hawley** considers that the absorption from the lower bowel of suboxidized products plays an important role in the causation of glaucoma. These toxic materials affect the outgoing canal, causing slight inflammatory conditions, which lessen their caliber, thus producing an imbalance between the inflow and out-

flow of the secretions of the eye. If cyclitis can be produced by these poisons, why not glaucoma?

**Vaughan** studied 20 cases of glaucoma during a period of two years. He concluded that the theory that hypertension alters with blood pressure is not proven. **Risley** reported the case of a woman 71 years of age, with high glaucomatous tension, whose hyperopic refraction passed into myopia, while under treatment, with the disappearance of the increased tension and pain. There was a uniform thinning of the sclera in the anterior segment of the eyeball, and a presumed increase in the anterior-posterior axis. **Morax** reports five cases of glaucoma caused by foreign bodies. The presence of the foreign body may or may not be recognized. **Menacho** in two cases of glaucoma, which came on in six hours following a discission operation for secondary cataract, after excluding all other possible causes, concludes that the nervous shock of the operation disturbed the balance of the circulation of the endocular lymph. Hypertension is the manifestation of this disturbance, whether there is a chemical modification of the lymph, or a mechanical obstacle to its evacuation.

**Schwenk** had a case of secondary glaucoma caused by a hyperreactive cataract. **Dernehl** gives an excellent review of the literature on the etiology of glaucoma. **Hamilton** used a few drops of 5% cocaine in the eyes of a man 61 years of age. The pupils were active and the tension and fields were normal. Blood pressure, 180 mm. The vessels were sclerotic. The vision with correction was normal. Acute glaucoma followed the use of the drops within a few hours. **Levitt**, by the use of one drop of 1% homatropin in a myopic eye with minus one tension, produced acute glaucoma. **Hughes** believes that holocain caused acute glaucoma in his patient. He used two drops of a 1% solution of holocain in an eye that he had treated during a period of years for glaucoma simplex, with the result of an attack of acute inflammatory glaucoma within a few hours. **Zimmerman's** review of the literature

on the pathology of glaucoma is a most excellent article. **Kusama** writes on adrenalin in the blood of patients suffering from primary glaucoma.

**SYMPTOMATOLOGY.**—**Fischer** applies the physical theory of diffraction to account for the haloes of glaucoma. The arrangement of colors in these rings is the reverse of that in the rainbow. He gives the mathematic demonstration to show how this arrangement of colors arises by the admission of light through small openings of  $\frac{1}{2}$  to 2 wave-lengths width. Experimentally the best haloes are obtained through gratings or rulings on glass of 20,000 to 40,000 per inch. It is important also that the opacity should all be in one plane. Attempts to reproduce the glaucoma haloes by bolting silk placed on the cornea, failed because of the coarseness of its fibers. A layer of lycopodium powder of a certain degree of thinness was more successful. But the haloes obtained were only suggestive of those seen through the fine ruled grating.

**GLAUCOMA SIMPLEX.**—**Gradle** after study of his case and a review of the literature of glaucoma simplex, arrives at the conclusion that the cases now classed as glaucoma simplex without perceptible rise in tension, belong to a disease *sui generis*, that is neither a true glaucoma nor a true uveitis. The disease begins as a low grade neuritis, limited to the anterior and vessel-bearing portions of the optic nerve, and leading to an absorption of the nerve fibers that produce the caverns described by Schnabel. The intermittent rises in tension are probably due to hypersecretion, which in turn might be caused by the low-grade chronic uveitis, produced by the action of toxins from the breaking down of the nerve tissue.

**SECONDARY GLAUCOMA.**—**Posey** reports a case of secondary glaucoma with large staphyloma of the cornea, following perforating ulcer, the result of granular conjunctivitis in a girl who had been under his care since childhood. He proposed to flatten the apex of the staphyloma with caustics.

**Koyanagi** reports the case of a shrunken lens dislocated into the anterior chamber and attached to the iris by its posterior aspect and to the cornea. He thinks that the luxation of the lens within the anterior chamber caused irritation of the iris and the ciliary body, followed by adherence of the iris and the glaucoma.

**NONOPERATIVE TREATMENT.**—**Grönholm** made 33 injections of sodium citrate in two cases of acute inflammatory glaucoma, two cases of chronic and two cases of absolute glaucoma. In the cases of acute glaucoma, there was a return to normal tension for a brief period. He thinks this method of treatment combined with miotics might be effectual, but it does not compare with operative procedure. **Thomas** follows the alkaline method of treatment. He gives sodium carbonate, 7 grs. and sodium chloride, 5 grs., t. i. d. in a glass of orangeade, and the sodium citrate locally. Also, two tablespoonsful of sodium bicarbonate in two quarts of hot water per rectum, morning and evening. In other cases, he uses the Fischer solution by the Murphy drip method. **Hawley** employs irrigation of the lower bowel in his glaucoma cases.

**Jackson** has used pilocarpin for ten years in the eye of a man 90 years old, with preservation of his vision and control of the tension in glaucoma simplex. **Bane, Walker and Thompson** also use pilocarpin in these cases. **Carr** reported two cases of acute inflammatory glaucoma, one of which was complicated with lues, relieved and the tension controlled by eserine. **Bradburne** would first try medical treatment in chronic glaucoma, and if that failed, he would operate. He depends on massage following the operation to keep the tension reduced.

**Sansum** reports his results in two cases of acute glaucoma in which he employed therapeutic dehydration to lower the tension. After the first graded intravenous injection of glucose the tension fell from 60.5 mm. to 26 mm. Eight days later, a second injection was given and the tension fell from 54 mm. to 18 mm. A third injection was made



seven days after the second one, and the tension fell from 66.75 mm. to 37.75 mm. Within 30 minutes, the tension fell to normal when an iridectomy was done. The second case was given one injection of glucose. The tension fell from 60 mm. to 20 mm., and then an iridectomy was performed. When this patient left the hospital, eserine and dionin were given to use locally. Six months later, the tension was 35 mm.

**Barkan** gives his conclusions on present methods of treatment as follows: (1) In one-eyed patients, no fistulating operation except in last resort. (2) In acute inflammatory glaucoma, miotics, then iridectomy, preceded by posterior sclerotomy. (3) In subacute or chronic glaucoma, iridectomy or trephining; the former, should the eye be relatively good; the latter if it is otherwise. (4) In glaucoma simplex while in statu quo, use miotics. Trephine if they fail.

**OPERATIONS.**—**Hill** gives a resumé of the surgery of glaucoma from the von Graefe iridectomy to the fistulating operations of the present. The subject is presented in clear and concise language.

**POST-CILIARY TREPHINING.**—**Ewing** used this method in two cases of glaucoma. The wounds were located between the superior and external rectus muscles beneath an 8 mm. conjunctival flap raised from below. The first wound was placed 7 mm. from the sclero-corneal margin, and the second one was 9 mm. from the corneal margin. The Elliot manipulation was the one chosen. The operation was successful in both cases. The objections to the operation are insufficient drainage, and liability to choroiditis.

**IRIDOTASIS.**—**Odeneal's** patient was a colored man 70 years of age. There was absolute blindness in both eyes of several years' duration. The tension in both eyes was 120 mm. (Gradle). An Elliot trephine operation was performed on the right eye. The tension fell to 40 mm. A month later, iridotasis was done on the left eye, and the tension fell to 40 mm. After 18 months the tension in the right eye has increased to 90 mm., but no increase in

the left. The surgical procedure was undertaken on account of severe headaches.

**Harrower** (Y. B., vol. 12, p. 163) performed iridotasis with uniformly good results in 23 cases. **Roy** reports a case of late infection following iridotasis, five years after the operation.

**LA GRANGE OPERATION.**—**Ellett** states the advantages of this operation: 1. Technic is similar to that of cataract extraction. 2. The conjunctival covering of the wound is not thinned. 3. A broad iridectomy is easily secured.

**SCLERECTO-IRIDECTOMY.**—Having arranged a speculum and fixed the eye with Graefe forceps, **Cilleruelo** dissects with scissors a conjunctival flap superiorly, which is turned forwards and a section made with a keratome 1 mm. from the limbus, penetrating into the anterior chamber. An iridectomy is then performed. The inferior lip of the scleral wound is raised with dissection forceps and a narrow piece of the sclerotic is extirpated by punch forceps. The same procedure is followed on the upper lip of the scleral wound, thereby making a fistula similar to that of the Elliot operation. The flap is replaced, and the operation is finished. **Cilleruelo** pointed out that the principles of the La Grange operation underlie that of Ruiz.

**THE ELLIOT OPERATION.**—**MacCallan** reports that in Egypt the Elliot trephine operation with iridectomy had almost entirely superseded the classical iridectomy. Late infection occurred in one case of 911 operations. Glaucoma was found to be the cause of blindness in nine per cent of all eyes examined. The total number of eyes examined was 11,955 in the course of a year. **MacCallan** performs a prophylactic operation on the unaffected eye when glaucoma attacks the other one, because of the frequency of glaucoma among the Egyptians.

**Clegg's** results in 259 cases of acute, subacute, and simple chronic glaucoma, in which he used the trephine operation, were improved 70, 47, and 32 per cent, respectively. Stationary, 25,

42, and 48 per cent, respectively; worse, 5, 11, and 20 per cent.

**Kirkpatrick** for the year 1916 reported 133 eyes that were trephined. Seventeen of these were blind and painful, and the operation was successful in lowering tension and relieving pain in fourteen. Eighty-eight trephinings were done on eyes whose vision varied from light perception to 6/6. Twenty-five of these had their vision improved and tension lowered; fifty-five of these had the tension lowered, but the vision was unaltered, and in the remaining eight, the vision was not so good as before the operation.

**Sobhy** trephined twice in the same eye for absolute glaucoma, and failed to relieve tension. The cause of failure in both operations was anterior subluxation of the lens, and the presentation of its equator in the trephine hole and faulty dissection of the flap. In both operations, the hole was too corneal. **Esmet**, in discussion, pointed out that blunt dissection of the flap prevents readhesion of the conjunctiva to the sclerotic beneath.

**Bradburne** makes a small buttonhole iridectomy about 3 mm., and follows with gentle massage. **Parker** believes that if fifty per cent of the selected cases of simple glaucoma can be relieved by iridectomy and fifty per cent of the remaining cases by trephining, the results of seventy-five per cent good would be better than most operations have been able to obtain. **Schoute** and **Waardenburg** in glaucoma with contracted fields, prefer the trephine operation to any other.

**LATE INFECTION.**—**Feingold** reports two cases of late infection following Elliot's trephine operation. The eyes presented the picture of panophthalmitis, but both of them cleared up, with restoration of vision in one of them, the media becoming clear in both. **Zaki Seddik** suggests the possibility of a small fistula along the line of the conjunctival incision becoming

the path for late infection. **Stirling** had blockage of the trephine opening in 3 cases out of 46 operated on for glaucoma. **Tooke** made a histologic examination of one of these eyes, and gives a complete report of the changes. **Stirling** thinks the stitch put in the flap may be the source of late infection. **Byers** has a paper on the complications and unfavorable results of Elliot's trephine operation, and **Filatow** reports his results with the Elliot operation in glaucoma.

**Greeves** examined microscopically specimens taken from four glaucomatous eyes in which the Elliot operation failed permanently to lower the tension, the cause being in each case prolapse of the ciliary processes into the wound made by the trephine. In no instance did the wound involve the true cornea for any distance. **Greeves** states that if the cornea be stripped superficially, and the trephine placed as far as possible forward, then the resulting wound must be well in front of the ciliary body. There can be no objection to placing the wound in the cornea, on the ground that the formation of new organized tissue is more likely to follow the procedure. Pathologic experience shows that the cornea is inert in producing new fibrous tissue in any quantity. The tissue that rapidly fills scleral wounds is produced by the episclera, the ciliary body and the choroid.

**Gunnufson** thinks the good results of operative intervention are not confined to iridectomy alone. For simple glaucoma, he prefers sclerecto-iridectomy; when this becomes acute he prefers Holth's iridencleisis. In glaucoma with fair vision, he prefers the Elliot operation. But he fears late infection and a resulting deposit of pigment on the anterior capsule of the lens, leading to cataract. In absolute glaucoma, he considers the trephine operation the most satisfactory from all points of view.



# THE CRYSTALLINE LENS.

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This review covers the literature relating to the crystalline lens from January, 1917, to April, 1918. Some references to traumatic dislocation of the lens and cataract will be found in the portion of the Digest dealing with Injuries, to be published later.

**EMBRYOLOGY.**—As the result of disturbances in growth **Vogt** states that grooves and linear elevations may occur on the posterior surface of the crystalline lens. Whitish lines and other anomalies may suggest an embryonal center of growth. They may even be found in children, and he thinks they may be concerned with the development of cataract.

**DISLOCATION OF THE LENS.**—As the result of being struck on the right eye with a baseball, a girl came to **Zentmayer's** clinic with a subluxated lens, the inferior border showing two shallow notches separated by a teat-like projection of the lens substance. The notchings were attributed to local ruptures of the zonular fibers and consequent alteration in the conformation of the lens. **Higgins'** patient had a history of repeated attacks of iritis with bilateral cataracts developing at the age of thirty-three. The right lens had been successfully removed. Upon examination it was found that the left lens had been dislocated without the patient's knowledge, doubtless due to a fall ten years prior to examination. A suitable correction gave 6/12 vision.

A man was struck on the left eye with a board causing a dislocation of the lens. When he came under **Black's** observation no trace of the lens could be found. At the time of the accident there developed an intraocular hemorrhage preventing any view of the fundus. **Posey** observed in one of his patients, a dislocated lens in the anterior chamber, while in the other eye there was a subluxation of the lens. **Marbourg's** patient complained of failing vision for a period of five years. The lower edge of the lens was found to be tilted slightly forward and there were evidences of secondary glaucoma.

**Thomson** has discussed the removal of partially and completely luxated

lenses. He refers to the dangers of cyclitis, glaucoma and sympathetic irritation. He states the removal of the lens is imperative when traumatically luxated and lying on the ciliary body. He believes iridectomy is seldom necessary, and when performed may add to the loss of vitreous. When the lens is completely dislocated and lies in the vitreous chamber, he regards it a good rule not to attempt extraction unless a clear view can be obtained.

In **Fagin's** patient there existed congenital cataracts, conical corneas and tremulous irides. The vision of the left eye was 4/200, with but light perception in the right eye. The lens was quite dense and during an attempt at needling was partially dislocated into the vitreous. This was followed by recurring attacks of iridocyclitis. Subsequently the lens was completely dislocated into the vitreous and owing to further attacks of iridocyclitis the lens was removed by the following method: With the patient looking up, a knife needle was pushed through the sclera into the vitreous engaging the lens, which was pushed up towards the dilated pupil. After the usual cataract incision the lens was pushed into the anterior chamber and extracted by the usual route. The operator states that not a drop of vitreous was lost. The eye became quiet with 20/200 vision.

**CONGENITAL AND ZONULAR CATARACTS.**—**Jackson** has emphasized the fact that poor vision is often obtained after operation on congenital cataracts because of other defects in the eye. He also calls attention to the importance of properly adapted lenses even in those patients with poor vision. Thus, in a boy whose vision was 0.08 with + 8.00 spheres, a + 18.00 sphere mounted one inch in front of the cornea permitted him to read 0.75 meter

type. In a patient of **Tooker's** there existed in each lens a posterior polar disc shaped opacity, surrounded by a clear ring which was in turn surrounded by an opaque annular zone near the periphery. From the posterior disc a conical opacity extended forward terminating in a small white spot at the anterior pole. There also existed bilateral corneal nebula and aniridia. Operation was unsuccessful. There was no history of consanguinity.

**Zentmayer** observed in a child a zonular cataract with stellate opacities at each pole of the clouded zone. In two other instances patients were seen with symmetric subcapsular punctate annular opacities, just beneath the anterior capsule. **Zentmayer** also recorded the data of a patient from **Chance's** clinic. In this case the opacities were symmetrically placed in the anterior and posterior cortex and limited to one-eighth the circumference of the perinuclear zone.

In the right eye of the child seen by **Collins** there existed an eccentric pupil with pigmented strands of retained pupillary membrane adherent to the lens capsule. The zonular cataract was incomplete and from the outer edge streaks radiated in front of and behind the lens. A few cortical dots were present in the left lens. The right eye and right side of the neck were injured at birth. The right lens in **Strickler's** patient exhibited a posterior central opacity from which radiated other opacities like the petals of a flower. In the left lens there was but a large opacity with pin point opacities in the anterior layers. The vision of the right eye was 20/200, of the left 20/30. In **Spencer's** case the bilateral opacities assumed a somewhat analogous form to that of the right lens just mentioned. They were of clover leaf shape and situated in the posterior cortex.

In **Holloway's** patient the opacities were similarly situated but were triangular in shape with the base down, and as seen with a +7.00 lens measured 3 mm. The opacities were made up of closely packed dots. A few discrete punctate opacities were present in the anterior cortical layers. The same ob-

server has recorded three instances of delicate ring-shaped opacities in the lens between the nucleus and capsule, the ring being made up of delicate pin point dots. Only in its situation could it be differentiated from the lesion described as **Vossius** ring-shaped opacity. The cases were associated with definite systemic conditions and with other intraocular changes. He thought the possibility of this lesion being acquired in certain instances, could not be wholly eliminated. See cases of **Weber**, **Schwenk** and **Zentmayer** below.

In the operative treatment of congenital cataracts **Tuto** favors combined extraction in two operations. He states that there is but slight reaction, and inclusion of the iris in the wound is avoided. He expresses the opinion that the majority of surgeons are drifting away from the older method of needling. **Mulock Houwer** has written concerning operation on zonular cataracts, but the literature is not available for review.

Inheritance in its relation to congenital cataract has been referred to by **Jones** and **Mason**. In a communication that could not be consulted **Santos Fernandez** has discussed the subject of operation for soft cataract in adolescents.

**PATHOGENESIS OF CATARACT.**—**Burge** has farther recorded his interesting laboratory studies on the production of cataract. (See *O. Y. B.* v. 11, p. 235, and v. 12, p. 385.) The first was a brief report stating that "in the production of cataract there are at least two factors, one, the short wave length of the spectrum, the other, inorganic salts such as those of calcium, silicon, etc., which are found to be greatly increased over the normal in cataractous lenses. By increasing either of these factors separately far beyond what the eye would ever be subjected to, an opacity of the lens, or cataract, can be produced. Cortical cataract can be produced by immersing the lens in a 5 percent solution of calcium chlorid and nuclear cataract by immersing the lens in a 15 percent solution of potassium chlorid. By increasing either of



these two factors simultaneously an opacity of the lens or cataract can be produced under conditions that might easily prevail in the body."

Later a detailed report was published showing the effect of various solutions on the crystalline lens as well as the influence of the visible and invisible spectrum. He found that the short wave-lengths of the spectrum produce a molecular rearrangement in the protoplasm of the cells of the crystalline lens; so that inorganic salts, such as are found to be greatly increased in human cataractous lenses, can combine with the protoplasm to precipitate it, and hence produce an opacity. He also found that a cataract could be produced in fish living in solution of those salts found to be greatly increased in human cataractous lenses, by exposing the eye of the fish to the radiation from a quartz mercury-vapor lamp. This cannot be done by exposing the eyes of fish living in tap water, which contains only very small quantities of these salts. In looking for the cause of cataract he is inclined to believe that at least two factors must be considered, the one a modification of the protein of the lens by ultra-violet radiation, and the other certain inorganic salts by which the modified protein can be precipitated.

Schanz in his studies on diabetic cataract found, that through the influence of light albuminous bodies were so changed that the easily soluble albumins were transformed into poorly soluble globulins. The process is first effective in the center of the lens, so that sclerosis of the nucleus, presbyopia, and finally senile cataract develop. He then details his laboratory experiments in which the lenses of hogs were used. He found that grape sugar and above all acetone, hastens the effect of light on albuminous substances; that is, they act as sensitizers or catalysors. The acetic acid which is set free from acetone under the action of light appears to change the albumins into globulins.

**SPECIAL VARIETIES OF CATARACT.**—To determine whether *glass workers cataract* should be included among certain other industrial diseases entitling

the worker to compensation, Legge investigated 513 workers and found the lens involved in 17.5 per cent in contrast to 6.8 per cent in 278 individuals in other work. The characteristic opacity was the posterior central cortical type. The average age of incapacity was about fifty-six years. He stated that few workers would wear protecting glasses, owing to the slow development of the condition and prejudice, as well as to the condensation of moisture on the glass. The committee permitted the disease to be scheduled but allowed compensation only in those cases subjected to operation, then for a period not exceeding six months. Burge believes the prevalence of cataract in this class is due to the excess of the radiant energy factor, associated with disturbance in nutrition expressing itself in an increase in sugar in case of diabetes, calcium salts, or some other substance which can combine with the lens protein made sensitive by the action of the short wave lengths.

As a result of "windage" resulting from the explosion of a hand grenade Mlady eight days later observed delicate radiating opacities in the cortex while ray-like opacities extended from the center to the cortex of the lens. There was complete clearing of the lens under the use of dionin and heat, and after eleven days the vision of the right eye improved from 6/36 to 6/12. In the first case of *traumatic cataract* observed by Wallace the vision was reduced to hand movements as the result of an injury by a pin which perforated the cornea and anterior capsule. In the second case the eye was struck by a piece of flying stone and while at first no injury of the cornea could be detected, the lens capsule was ruptured and lens material was protruded into the anterior chamber. Later a successful needling was done. Some ten days after the injury a delicate corneal scar was discovered.

Teulières, after considering the various aspects of traumatic cataract and its extraction stated he believed different standards must be established for war conditions than those that prevail in civil practice. He recognizes four

classes, and the indemnity allowed varies from 5 to 15 per cent. **Mayou** has referred to a case of siderosis. The patient was a lathe worker, and with the pupil dilated, opacities could be noted in the capsule and deeper portions of the lens, associated with several rust colored spots.

**CONCURRENT CONDITIONS.**—When **Garcia Mansilla's** patient with bilateral cataracts came under observation there was a decided history of *hysteric amaurosis*. Following an operation for dacryocystitis, blindness persisted for twenty days. Later an uncomplicated extraction was done and following this there was another attack of amaurosis which persisted for three days. At the time of dismissal the vision was 2/3 with an appropriate correction. In **Weber's** case of *mongolism*, affecting a Hebrew infant 13 months old, there existed an internal strabismus and "nystagmus-like" movements associated with congenital cataracts. After stating that the only published account he could find of an association of mongolism with congenital cataract was that referred to by Hill, he briefly discussed mongolism but made no reference to the type of the congenital cataract. (See Year Book, vol. 9, p. 411.)

Recording his findings in another case of *atrophic myotonia* and cataract, **Fleischer** referred to the myopathic facies, atrophy of the sternomastoid and small muscles of the hand. Emaciation, alopecia, atrophy of the genital glands, vasomotor and psychic disturbances are not infrequent; and like the presenile cataract, are apparently due to serious derangement of the internal secretions. Cataract is often the first indication of the trouble. In **Risley's** case of bilateral *diabetic cataract* there occurred a subsidence in the amount of swelling of the lens and some clearing of the cortex while the patient was under observation. Risley stated that this is the first case in which he believed the presence of sugar was primarily the cause of the opacity of the lens. A brief note has also been made by **Robinson** concerning lenticular opacities dependent upon diabetes.

When **Schirmer's** patient was first seen there existed a post-operative *iridocyclitis* in the left eye, the right eye having a mature cataract. This was removed without an iridectomy to avoid danger of an iritis. The recovery was uneventful, and two weeks after the extraction the left eye was removed. As the patient was well under the influence of mercury and it was important for him to return to work, Schirmer felt that the conditions warranted the procedure adopted.

**COMPLICATED CATARACTS.**—**Talmey** obtained a final result of 20/70 vision after operation on a patient with *hyper-mature cataract* complicated with acute glaucoma. For the latter an iridectomy was performed and six weeks later a Homer Smith operation was performed, the extraction being resorted to a half hour after the discission. An iridotomy was subsequently required. When performing the preliminary discission in the Homer Smith operation, to make the horizontal capsular cut he recommends two separate incisions each from the periphery towards the center of the capsule. The successful extraction of a Morgagnian cataract also has been referred to by **Parrott**. Twenty-one days after the onset of Rocky Mountain fever, **Strader's** patient developed an iridocyclitis that was followed by secondary cataract.

**MACULAR PERCEPTION IN ADVANCED CATARACT.**—In order to test the condition of the macular region in cases of cataract, **Young** has resorted to two different methods, the first of which he thinks would be chiefly suitable for more intelligent patients. In the second test, which he believes would be applicable to any type of patient, he uses three discs perforated by two, three and four holes respectively, within a central area of less than 3 mm. These are placed successively in the frame and the eye is brought close to a frosted focus light showing through a large aperture of a chimney. The patient is then told to point out the relative positions of the points of light. He believes a two hole disc to be the most serviceable.



**SPONTANEOUS ABSORPTION OF CATARACT.**—**Higgins** has recorded the brief notes of a case where the vision became markedly impaired but later on distinctly improved, although there was no history of injury or operation. When the eye was examined there was a central movable pupil with considerable opaque capsule. **Menacho** has contributed a discussion on this subject, and refers to the influence of luxation and the various theories bearing on resorption. In those cases where lenticular opacities clear up he believes certain favorable changes in the general nutrition of the patient bring about improved conditions in those intraocular structures that have an influence on the lens. In his patient a subluxated congenital cataract was in the process of absorption. **Koster** has also observed a case of resorption. When examined the cataract was membranous without a trace of the nucleus. Discission sufficed for producing a return of vision.

**DISCISSION.**—In an infant with congenital cataracts **Schwenk** attempted a discission in the one eye at eleven months, and in the other eye at fourteen months. Each attempt was unsuccessful owing to toughness of the capsule. Later the anterior chamber was opened with a keratome, the anterior capsule grasped with forceps and the lens delivered with the capsule. A similar procedure was attempted in the other eye; but the capsule was torn and some cortex remained in the anterior chamber. At the age of 16 months he ordered +8.00 spherical lens for each eye which corrected a divergent squint that existed prior to operation. Following a second discission of the lens for congenital cataract the nucleus dropped into the anterior chamber, **Zentmayer** passed a keratome behind the nucleus making slight pressure upon the cornea as the keratome was pressed back thus allowing the nucleus to escape along the blade. In the treatment of congenital cataracts **Zentmayer** believes repeated discission is the safest method. (See Tuto above.)

**NON-OPERATIVE TREATMENT OF CATARACT.**—To dissolve cataractous opacities

**Pollock** employs the following: Sodium acetat, Sodium citrat, Sodium chlorid, aa gr. XL, Tr. Cocci cacti, q. s., Aq. rosae, ad. oz. IV. One teaspoonful of this solution is added to three of boiled tepid water and the dilution is employed in an eye bath for three to five minutes. After a rest of two minutes a drop of the following solution is instilled into the conjunctival sac: Trunacek's solution, (Allen and Hanbury) M i: aq., ad. dr. i. This is resorted to three times a day. After a week the salines in the above formula are increased to gr. LX and Trunacek's solution to M ii. Subsequently they are still further increased. The iodides may be added to the above solution, while dionin may also be used. The treatment is carried on for six to eighteen months in conjunction with internal treatment. (See Year Book v. 12, p. 177.) **Guilleuma** after referring to the use of iodides in cataract, cited an instance where he believed the progress of the cataract was stayed by ionization. The solution used was a one per cent sodium iodid with a current of 1 milliampere for five minutes. **Castañer Marti** testifies as to the good results obtained by the local use of sodium or potassium iodid in two per cent solution, when the vision has not been reduced less than one sixth. After referring to the importance of the early treatment of cataract **Blackburn** commented on the efficiency of Smith's recommendation of subconjunctival injections of cyanid of mercury. He has referred to his favorable results in six cases.

**Thompson**, after calling attention to the influence of various conditions of the uveal tract and the effects of eye strain as etiologic factors in the production of cataract, states that every layman is familiar with the fact that cataract is not a frequent condition even in the very old. He then refers to proper constitutional treatment, the use of dionin, subconjunctival injections of cyanid of mercury and instillations of eserin locally together with adequate ocular rest and correcting lenses. He refers to nine cases, but is not specific as to treatment.

**Campbell** has recorded an improvement in visual acuity in a rheumatic patient after the use of radiant light and heat, autocondensation and galvanism. The last was chiefly employed, the negative pole being applied to the eyes. He used three to ten milliamperes for twenty minutes daily. After three months the vision improved 20/70 to 20/30. **Adams** mentions the use of tinted lenses and a suitable correction as prophylactic measures and then testifies as to the efficiency of Smith's treatment. He does not mention the number of cases so treated.

As one of a committee to investigate the efficiency of *apis mellifica* in early cataract **Helfrich** found slight improvement in one of nine cases that could be kept under observation. While recognizing the few cases studied he believes the remedy to be without value. **Parenteau** has recorded his results with the use of magnesium carbonat and *secale cornutum*. **Scheube** states that inasmuch as the best results claimed for the non-operative treatment of cataract are a partial clearing of the opacities and an improvement of vision, such treatment must be regarded as ineffective. The studies of **Meyer-Steineg** have been referred to in the Year Book, v. 11, p. 238. It was not possible to consult the contribution of **Lobanoff** concerning sodium and potassium iodid.

**COUCHING.**—**Elliot** has made an excellent contribution to this interesting subject, and in separate articles has referred to its history and diagnosis. After an historical review he analyzes the collected records of 780 cases so treated in India. The cataract is approached anteriorly, through the cornea or limbus, or posteriorly through the sclera well behind the ciliary body. Among 550 cases the vision was  $\frac{1}{3}$  or better in 10.59 per cent;  $\frac{1}{10}$  or better in 21.64 per cent. He regards 60 per cent of the loss as avoidable. Iritis and iridocyclitis were responsible for 36 per cent of the failures, glaucoma for 11 per cent and imperfect dislocation for 9 per cent.

His pathologic findings were based upon a study of 54 globes. Dislocation

of the lens backward and downward was most frequently found. The inflammation of the uveal tract was of the plastic type and chiefly affected the iris and ciliary body. Proliferative retinitis was encountered but once and sympathetic inflammation was found to be rare. In the great majority of the globes the vitreous had become detached and shrunken. The retina was found to be detached in 38 of the 54 globes. He dwells upon the frequency of retinal dots in many of the cases where the retina was not detached. As to the diagnosis he states three things must be determined: first, has a couching been done; second, the position of the lens; third, the advisability of operation. These are discussed in detail.

**PREVENTION OF SEPSIS IN CATARACT EXTRACTION.**—**Herbert** has outlined his routine against infection. Dacryocystitis cases are rejected until some weeks after removal of the sac, while the chronic conjunctivitis cases are treated with irrigations until the discharge is scanty. All instruments are used dry, the knife being cared for solely by the operator. The surgeon wears a mouth screen soaked in perchlorid. Shortly before operation the conjunctival sac is irrigated with 1-3000 perchlorid for from one and a half to two and a half minutes. A few drops of 1-1000 adrenalin are then instilled, and two minutes later a four per cent solution of cocain, which is repeated every two, three or four minutes. At the end of fifteen to twenty minutes the eye is ready for operation. The meibomian glands are then expressed, after which the lids are everted and the conjunctival sac freely washed. This lavage is done with sterile water or 1-3000 perchlorid. The speculum is then inserted and the eyelashes of the upper lid beyond the bar snipped off with curved scissors. During the operation the cornea is kept moist. Before reintroducing the same instrument into the eye it is dipped into boiling water. A conjunctival flap is used.

**ATROPIN IN CATARACT EXTRACTION.**—**Fisher**, who usually resorts to a combined extraction, has found it most sat-



isfactory to instill into the conjunctival sac a drop of sterile atropin solution just after the speculum has been inserted, and then proceed with the section. By the time the operation is completed the pupil is found to be yielding widely and circularly and a mydriatic will not be necessary for three or four days. He has also found it of service in cases of iridectomy without extraction. **Thomson**, in commenting on the above suggestion, states that it is in no sense new and that he had observed on the continent the extraction of cataract with the pupil dilated. While **Fisher** introduced the drop while the patient is on the table he believed the principle to be the same. **Taylor** in referring to this procedure states that with others he has resorted to the use of atropin before extraction. He also questions whether any of the solution comes in contact with the iris and finally discusses the advantages of simple extraction. In reply to these opinions **Fisher** states that the method of **Thomson**, who introduced the drop a few hours or the day before, is quite a different procedure. **Taylor**, he believes, has equally missed the point of his suggestion, and while he opened up interesting fields, his discussion left him nothing to answer. (See **Castaner Marti** below.)

**CORNEAL SUTURE.**—**Colin** has discussed the advantages and inconveniences of simple extraction with the use of the corneal suture. As to the advantages he refers to the elimination of iridectomy, less risk of vitreous loss and shorter confinement to bed. Among the inconveniences he speaks of iris prolapse, greater frequency of secondary cataract, prolonged and more difficult operation, removal of the suture and possibility of infection. The methods of **Kalt** and **Chevallereau** are then described in detail, as are the successive steps of the operation. As soon as the anterior chamber is reformed the sutures are removed, the eye being thoroughly cocainized. **Kalt** prefers the third or fourth day, **Chevallereau** the sixth or even eighth. After moistening, the suture usually comes away readily. But at times it is more diffi-

cult and evacuation of the anterior chamber has occurred at this time. Infection occurred but three times in 800 cases. Needless to say the corneal suture is contraindicated in the presence of pathologic conditions of the lacrimal canal.

**Marquez** has likewise advocated the use of the corneal suture not only in cases of cataract, but as he has detailed in his contribution, it has been of service to him as a precaution against infection in case of rupture of the globe following a blow upon the eye. **Moron Ruiz** advocates the use of a suture in all cases, stating that it can be removed immediately after the operation in case it is not required. He believes the procedure avoids or corrects accidents which if they have occurred would ordinarily offer an unfavorable prognosis. He cites a number of case reports. **Andrade** also regards extraction with corneal suture as the operation of choice; twelve of his group of cases being by this method.

**IRIDECTOMY OR SIMPLE EXTRACTION.**—**Santos Fernandez** believes that extraction with iridectomy and a conjunctival flap, what he sees fit to describe as the American methods, is the safest and the one that gives the greatest assurance of success. **Perez Bufil** likewise believes that the advantages offered by iridectomy should make it the operation of choice and thinks they offset the simplicity of operation and absence of pupillary deformity of the simple extraction. **Blanco** and **Andrade** do not concur in these opinions. The former believes that iridectomy should be avoided when possible, altho he acknowledges that prolapse of the iris, when it does occur, is smaller than when an iridectomy is not performed. He emphasizes the frequency with which prolapse of the capsule occurs in the combined operation. In complicated cataracts he believes preliminary iridectomy justifiable.

The last mentioned observer prefers simple extraction to the combined method owing to better functional and cosmetic results. He comments on the danger of iris prolapse but believes this is rare with proper section of the cor-

nea and the use of a miotic for the first six days after operation. In all complicated cataracts he favors the combined method, or preliminary iridectomy followed in fifteen days by extraction. **Castañer Marti** advocates simple extraction and the use of a median conjunctival flap. Atropin is instilled the day before and the day of operation. Alypin and stovain are used for anesthesia. After the operation a few drops of eserin are instilled into the conjunctival sac. Taylor, as above mentioned, has enthusiastically described the advantages of simple extraction.

**IRRIGATION.**—**Newman** has added the results of two hundred and fifty additional cases where irrigation has been used after extracapsular extraction of cataract. In his total of five hundred cases 93 per cent were irrigated, and in 80 per cent iridectomy was performed. Secondary needling was required in approximately 2.15 per cent of the cases; iritis developed in 5.6 per cent, while there was some vitreous loss either primary or secondary in 2.4 per cent. The visual results were good in 91.75 per cent of the cases; fair in 6.25 per cent, and the eye was lost in 2 per cent. In twenty-six cases the iridectomy was performed secondarily. As in the previous series the incidence for iritis was rather high. It was usually late in its onset and was attributed to the idiosyncrasies of the patient. Messrs. Down Bros. of London now stock the irrigator with the laterally placed slot as used by Newman. (See Year Book, v. 13, p. 188.) **Andrews** has described an irrigator with a rubber bulb attachment, the pattern being much the same but larger than the one previously described by him. There is a receiving chamber with a capacity of two fluid drachms, so it becomes unnecessary to draw fluid into the rubber bulb.

**SUCTION METHOD OF EXTRACTION.**—**Barraquer** has described what he regards as an ideal method of extraction. To the anterior surface of the lens there is applied a tiny cupping glass which is attached to a metal stem. By means of an electric motor the air within the

cup can be evacuated and controlled. When properly applied the cataract and suspensory ligament can be manipulated and the lens completely removed without difficulty. No pressure is required, neither is it necessary to introduce any sharp instrument within the eye. He believes that loss of vitreous is prevented by the absence of pressure and the avoidance of other intraocular instrumentation. Among thirty-five mature, five hypermature and four immature cataract extractions, all were successful but two, and in these the capsule had been previously lacerated. In another contribution **Barraquer** with **Anduyned** (A. J. O. p. 370) gave a historical review of cataract operations with illustrations of their apparatus.

**Wieden** speaks enthusiastically of the above procedure, stating that the operation is practically reduced to the making of the corneal section and conjunctival flap and that iridectomy is but rarely necessary. He states that no operative mishap had occurred among 127 cases and he believes this method will supersede the Smith operation. **Marquez**, on the contrary, is not so optimistic and states that the idea is not original, a similar procedure having been described by Hulen in 1911. (Y. B., v. 8, p. 188.) He contends that the claim that it avoids secondary cataract and lessens the resulting astigmatism is not tenable. Further, the risk of infection is just as great if not greater. He concludes by saying there is no such thing as an ideal method of extraction, and then comments on the value of the corneal suture.

**INTRACAPSULAR EXTRACTION.**—In a splendid resumé of the intracapsular operation **Knapp** has expressed the opinion that a conjunctival flap is essential in the modern operation for cataract; that in many hands the vitreous loss will be higher than 5 per cent, but that post-operative iritis is much less frequent than by the capsulotomy method. He regards the necessity of subsequent needling as one of the great drawbacks of the capsulotomy method, while the applicability of the intracapsular method to immature cataracts is one of its chief advantages. He quotes



the opinions of nine American ophthalmic surgeons who have been especially trained in the Smith operation, but space does not permit a review of these opinions. He does not believe we are justified in increasing the number of poor results and failures referable to the method, in order to secure better vision in some cases. However, the results to be attained are so ideal that our endeavors should be directed towards devising some method of intracapsular extraction that is less dangerous than the Smith-Indian operation. **Meding**, referred to below, thinks **Knapp's** statement regarding the surgeons trained in this method should read: "Of eight who have studied under Smith, six are still enthusiastic, use and advise the operation, and one who has not been to India, uses it in fifty per cent of his cases."

**A. S. and L. D. Green** believe that unless one has had an opportunity for personal instruction and thorough training, the Smith-Indian operation should not be resorted to as a routine procedure. They mention five points to be considered in connection with this procedure. The type of cataract best adapted to it is the senile; of these the immature and the Morgagnian give the best results. Age is a factor, owing to the greater resistance of the suspensory ligament in young individuals. The deep-set eyes with wide palpebral fissures and lax lids are those best suited, while the nervous patients with a tendency to spasm of the lids on slight provocation, are apt to expel vitreous. (See below.) **Hallett** has reviewed the merits of this method of extraction and his results are recorded below. **Tiffany** has also referred to the operation.

**Millette** has recorded his satisfaction with the open method of after treatment, his opinion being based on his results in over 200 cases at the National Military Home at Dayton, Ohio. He calls attention to the fact that all of the patients are men well advanced in years, and many of them suffering from the chronic ailments of old age. After referring to his technic he discusses the after treatment. The eye is examined

the morning after the operation and if satisfactory, a very light pad is placed over the eye. An aluminum shield is worn at night. If the eye is satisfactory the second morning after operation, no dressing is applied altho a protective shield is used at night. The patient is allowed to sit up the second day. He believes the above method of after treatment lessens the danger of infection.

**Mills** believes that intracapsular extraction should be performed only by men of large experience, and regards the intracapsular extraction through the intact pupil as the ideal method. While no one method should be followed in all instances, he believes the visual results in the Smith-Indian operation are ideal in selected cases, although the cosmetic results are not as attractive. In selected cases extraction of the encapsulated lens through the intact pupil is a simple procedure in skilled hands. After a typical but large Smith incision the lens in its capsule is moulded through the intact pupil slowly and cautiously, the delivering pressure being applied through the cornea by a hook, or in trustworthy patients through the lower lid by finger pressure. The lids are controlled by **Prince's** upper lid retractor, and **Fisher's** lower lid retractor. After delivery of the lens the pupil is usually displaced upwards, but if a 1 per cent solution of eserine is instilled it becomes small and centrally placed. To prevent subsequent irritative symptoms it is now **Mills's** custom to make three instillations of eserine at five-minute intervals while the patient is still on the table. The **Greens** have expressed the opinion that simple extraction is not well adapted to the intracapsular operation.

**Maynard** has almost ceased performing this operation owing to the frequency of complications; of 1,325 cataract operations performed in 1916, only 26 were removed in the capsule. Despite all precautions, he has not been able to reduce his percentage of suppurations below one per cent. **Fisher** criticises **Maynard**, **Herbert** and **Elliot** for condemning the operation before

seeing Smith operate. He resorts to this method in about 70 per cent of his cases, but uses a smaller incision than Smith. He attaches great importance to the iridectomy, and cuts the iris at right angles to the corneal incision. His incidence for vitreous loss was 7 to 8 per cent; and in three years he has had three cases of choroidal hemorrhage. The chief postoperative complication was iris prolapse. He states he is disappointed when his visual results are not 6/12 or better a few months after operation. **Elliot** takes exception to the above criticism and states that he criticised the statements made in support of the operation but maintained an open mind as to the actual procedure. After seeing Smith operate and then trying the operation on two or three hundred cases, he returned to the method to which he was accustomed.

**Corry** and **Shanker** believe a very large incision equalling two-thirds or three-fourths of the corneal circumference should be made in all cataract operations, irrespective of the method adopted. To support this view they have minutely discussed the physico-anatomic conditions relating to the point in question. They then discuss the various advantages and disadvantages of the large incision. The question of the best site for operation is referred to in detail with reference to their conjunctival flap suture, and their suture through the conjunctiva and external canthus to fix the "orbicularis to the temple" which controls the upper lids and eyebrows. They have discontinued the use of a bandage in ordinary cases and instead of stitching the outer canthus to the temple they fix it by a loop which passes around the ear. When the eye is closed a thin layer of cotton wool over the lids, brow, cheek, forehead and temple is held in place by collodion. The character of the paper does not admit of satisfactory discussion in this volume. An echo of the Col. Smith-Corry and Shanker controversy has been heard in this country emanating from **Green**. The reviewer questions whether the average reader who reviews this criticism, which is anything but pleasing, will believe that

it emanated from an open mind. He concludes with the statement that **Schweigger** as early as 1897 performed downward extraction of the encapsulated lens, practically as described by **Corry** and **Shanker**.

In a contribution not available for review, **Coderque** has described a new operation for cataract.

**COMPLICATIONS. DELAYED FORMATION OF ANTERIOR CHAMBER.**—On the third day after a successful extraction, **Bernstein** found the upper lid inverted, causing the wound to gape; there was also a partial prolapse of the iris with the presentation of a bead of vitreous. Reposition of the lid relieved these conditions, but there occurred successive prolapses with spontaneous replacements and the wound failed to properly close for over two months, despite the fact that a conjunctival flap was dissected up and brought over the wound. When the patient was last heard from, vision was reduced to light perception. No infection of the eye occurred.

**INTRAOCULAR HEMORRHAGE.**—**Gros** and **Fromaget** have reported concerning two instances of expulsive hemorrhage. The first occurred in a woman with moderate myopia with favorable operative conditions. After an uncomplicated removal of the lens a large globule of normal vitreous appeared in the lips of the wound. The vitreous was removed and a firm bandage applied. There was considerable ocular pain. At the first dressing forty-eight hours later, another hemorrhage occurred. The eye became atrophic. Subsequent examination showed a blood clot between the choroid and sclera, with the entanglement of the retina in the corneal scar.

The second patient was a sclerotic male with favorable local operative conditions. Immediately following the removal of the lens there was a violent attack of pain followed by a progressive escape of unstained vitreous until the globe was practically emptied. There was no external hemorrhage. The lens of the other eye was successfully removed after a preliminary sclerotomy, with an **Elliot** trephine, well back towards the equator between



the superior and external recti. With **Parrott's** patient, who was an atheromatous individual, an expulsive hemorrhage occurred several hours after an uneventful extraction. It was profuse and the oozing continued for several hours. The globe collapsed.

**INFECTION.**—**Shanker** has referred to the divergent views on suppuration after cataract operation, and quotes freely from Herbert and Fisher. When this has occurred, aside from the usual procedures he has used subconjunctival injections of 30 grs. sugar solution and 20 minim doses of phylacogen. In certain instances fibrolysin has apparently caused absorption of inflammatory products, but he also feels that it may have a deleterious effect upon the cornea. Morphine and scopolamine, as recommended by Meller, have not been satisfactory in his hands. He does not believe in tutoring a patient prior to operation, and thinks that in extraction eserine is extremely useful, and should be dropped actually in the anterior chamber and on the iris itself. See Maynard above.

**DELIRIUM.**—After a brief review of the literature **Brownell** refers to the etiologic factors concerned in 32 cases of postoperative delirium, occurring among 962 cases of extraction at the Ophthalmic Clinic of the University of Michigan from 1904 to 1917. The average age of the patients was  $72\frac{1}{3}$  years; in no case did the urine indicate nephritis; 36 per cent used more or less alcohol. Syphilis was not regarded as a factor.

The symptoms usually begin on the second night after the operation, and persist on an average of one to two days. Special nurses for all cases was regarded as the best prophylaxis. Greater success was obtained from such drugs as trional and veronal than from morphine and codeine. If necessary, hypodermics of hyoscin, gr. 1/200 were given, and in the severe cases chloretone, gr.v-x by rectum. He also refers to the advisability of removing the dressing from the unoperated eye. If the anterior chamber is formed the patient may be allowed to sit up. **Thomp-**

**son** has referred to descemetitis following cataract extraction.

**GENERAL PAPERS ON CATARACT.**—Twenty-six years after the removal of a cataract for cosmetic reasons, **Black's** patient returned complaining of failing vision in the other eye, the result of lenticular opacities. The examiner was astonished to find that the aphakic eye had 20/30 vision when properly corrected.

After trying the eyes of various animals for teaching operative technic, **Fisher** found that the eyes of kittens four to five weeks old were by far the most satisfactory. The kittens are first killed, the lids and nictitating membrane removed, after which muscle operations can be performed. The eye is then enucleated and fixed in a mask which can be improvised from a cigar box. He also refers to the technic of the intracapsular operation, especially the use of his hooks and needle.

**Sherman**, while he admits that the Smith-Indian operation may be justifiable in the hands of a few, believes that it insures too great a risk to be attempted by the ordinarily trained ophthalmic surgeon. He believes one's technic should be adapted to the conditions as they arise in any given case at any stage of the operation, and that no one method is safe in all instances. **Perry** believes that "safety first" should be the dominant idea of the operator. He refers to the general condition of the patient, and believes the transient increase of blood pressure to be more dangerous than the constant. He refers to the investigation of the kidneys, conjunctiva and the importance of proper cocaineization. He advises a large corneal incision and does an iridectomy in all cases. "Not over one in three knives purchased in the open market is equal to this work. The knife I use is from Weiss, London, and yet I find that even from this source, one knife in four lacks the keen edge and point for good work."

After referring to the etiology of cataract, **Hughes** refers to its treatment. He does not believe that local medicinal treatment is of value. He employs five instillations of a six per cent cocaine

solution at three-minute intervals; prefers lid elevators instead of a speculum; uses a conjunctival flap, and as a rule resorts to combined extraction. He then briefly discusses the various complications of cataract extraction.

**Fellows** believes that it is not necessary to wait many hours to extract the lens after the capsulotomy in the Homer Smith operation. In making his incision, after clearing the pupillary border of the iris with the knife, allowing the aqueous to escape before completing the incision, prevents escape of the lens and vitreous. He now uses one of the several hooks on the market instead of a speculum. In case of hemorrhage following an iridectomy he washes out the anterior chamber with salt solution before resorting to the capsulotomy. **Smith** advises against the intracapsular operation in cases of hypermature cataract and when confronted by the ocular evidences of specific disease; but he believes it to be the operation of choice in immature cataracts, if there are no complications. He believes capsulotomy is indicated in young individuals and in the presence of a tremulous iris. He also believes that capsulotomy is indicated if the blood pressure is higher than 220; if sugar is present in the urine in a greater amount than three per cent; if the patient is high strung and nervous, and if there is a history of retinal hemorrhages. He prefers the intracapsular method and after this the Homer Smith operation.

As a protection to the eye after cataract extraction, **Kirkpatrick** has advised a special form of goggles, consisting of two aluminum shields which conform to the shape of the orbital margin, connected by a bridge of tape and held in place by a tape passing around the head. There is a large opening in each shield and the opening in the shield before the operated eye contains an amber glass. The day after operation these goggles are worn instead of a bandage, the patient not being confined to bed. Not only does the use of these goggles permit better drainage and more mental comfort for the patient, but in addition he believes the

eyes are quieter than when a bandage is used. **Koroleff** has discussed the question of whether life on a fleet may influence the development of cataract. **Frost's** paper concerning astigmatism of the lens after iridocyclitis, was not available for abstraction. The same is true of **Santos Fernandez's** discussion on technic in cataract extraction.

**AFTER CATARACT.**—For more or less opaque membranes **Woodruff** prefers the Ziegler knife, altho he is not partial to the Ziegler operation. For thicker membranes he speaks of the usefulness of irido-cystectomy as described by Knapp, and cites an instance where this operation gave perfect vision. He also refers to an instance where iridectomy (Elschnig) was successfully resorted to. As some of these operations are more painful than ordinary extraction, a ten per cent cocaine solution is used for anesthesia.

**Heyl**, in discussing the question of the frequency of after cataract following extraction of mature or immature cataract, refers to the frequency of after cataract operations performed by various operators. He cites the opinion of Hess, that the extractions of immature cataracts are not followed more frequently by after cataract than extractions of mature cataract. In one hundred cases with complete cortical opacification, after cataract operation was necessary in ten; in ninety-two cases with incomplete cortical opacification, in nine; in eight cases of complicated cataract, in three. In forty-eight of the one hundred cases of complete involvement, large cortical remains were removed by the Hess shovel, while in ninety-two cases with partial involvement a similar procedure was necessary in but ten. In the Year Book, vol. 11, p. 250, reference is made to **Falchi's** peripupillary combined cystotomy. In a recent translation it is stated that recovery from this operation usually takes about ten days, and that the operation should not be undertaken prior to six weeks after the extraction.

**RESULTS.**—Among three hundred cataract operations recorded by **Kollock**, two hundred and seventy-one were successful, fourteen were doubtful, and fit-



teen were total failures. In nearly all cases an iridectomy was done. In ten of the three hundred cases a discission was performed, and in but two instances was the Smith-Indian operation resorted to. One case was complicated by an intraocular growth, another by an expulsive hemorrhage, and in fifteen cases there was a loss of vitreous. There were three instances of black cataract. In a case of buphthalmos the cataract was easily extracted and the convalescence was uneventful. Postoperative delirium was encountered but once, and in one case corneal infection was successfully treated by the actual cautery.

**Knorr** reports his statistics in one hundred cataract extractions. Eighty were combined extractions, thirteen simple extractions, two with button-hole iridectomies, and five were Smith operations. Ninety of these were successful; that is, without infection or prolapse of the iris; five were partially successful, and five were unsuccessful. Four of the latter occurred among the combined extractions and the other was a simple extraction. Of the ten unsuccessful cases two were lost from infection, while six others developed iridocyclitis. Vision was lost in four instances; loss of vitreous occurred eight times, the Smith operations furnishing four of these. In forty-one cases the anterior chamber was irrigated with normal salt solution. In forty-nine per cent the vision was 20/60 or better; in nine per cent unrecorded. **Moulton** has recorded the results of one hundred cataract operations, but as presented they do not permit of accurate abstracting by the reviewer. He believes in the use of a conjunctival flap and prefers the combined extraction except in selected cases, when he resorts to simple extraction.

**Kirkpatrick** states that of nine hundred and thirty-five operations performed at the Government Ophthalmic Hospital, Madras, forty-five were intracapsular, and in eight hundred and ninety the capsule was lacerated. Among the forty-five intracapsular operations, thirty-eight were successful,

two partially so, and five were failures; all of the last number being dependent upon vitreous infection subsequent to operation, giving rise to iridocyclitis and glaucoma. Among the eight hundred and ninety operations, 83.71 per cent proved successful, 11.46 per cent partially so, and 4.83 per cent failed. More than two-thirds of those regarded as partially successful could have been improved by secondary operations.

**A. S. and L. D. Green** have recorded carefully compiled statistics of one hundred and forty-six consecutive intracapsular extractions. Since January, 1916, they have resorted to combined extraction in preference to preliminary iridectomy. In seventy-six cases the section was corneal, in fifteen limbal and in fifty-five a conjunctival flap was used. They regard adherence of the iris to the wound, and down growth of epithelium from the wound into the anterior chamber, as the chief objections to the corneal section. As to complications, iris prolapse occurred in 6.8 per cent, vitreous loss in 13 per cent, iritis in 3.5 per cent, while in no instance did suppuration occur. Intraocular hemorrhage, glaucoma and retinal detachment each occurred in two instances. In ten cases the capsule ruptured, while in seven cases secondary operations were required. In one hundred and nine uncomplicated cases, ninety-four had final visual acuity of 20/40 to 20/15; ten had better than 10/200; two had 1/200 to L. P., while in three instances the patients did not return for refraction.

**Meding**, while he believes the Smith-Indian operation to be phenomenal for absence of irritation or inflammation, uninterrupted recovery and resulting eye health, points out that training and experience are essential and that there is no short cut. In his series of one hundred and twenty-three cases, eighty-three were by this method, and in twenty a capsulotomy was performed. In the former group, 63 per cent had a visual acuity of 20/40 or better and 18 per cent 20/70 or better; prolapse of the iris occurred in nine cases, and of the vitreous in fourteen instances. In the capsulotomy cases.

45 per cent had 20/40 or better and 40 per cent 20/70 or better. Iris prolapse occurred in five and vitreous prolapse in four cases. He attributes ocular hemorrhages to abnormal ocular conditions and iris prolapse to inaccurate section, unruly patients and disturbance of circulatory and metabolic functions during convalescence. He believes vitreous prolapse to be inseparable from cataract extraction.

After reviewing the merits of intracapsular extraction **Hallett** cites his results in eighteen cases. The vision was 20/20 or better in nine cases, 20/25 to 20/50 in five, 20/100 to 20/200 in two and in one case the eye was lost. The average was 20/25. In no instance was there a vitreous loss, but two patients developed iridocyclitis. **Tzytowski** has

tabulated his results in three hundred and three extractions, of which one hundred and thirty-six were intracapsular, while in one hundred and sixty-seven cystotomy was employed. In the former group, vitreous loss occurred in 29.5 per cent, in the latter 9.5 per cent. In the intracapsular cases, iris inclusion occurred three times; delayed closure of the anterior chamber in 4.4 per cent; iritis and iridocyclitis in 9.5 per cent. Among the capsulotomy cases these conditions respectively developed twice, 6.3 per cent and 13 per cent. Two eyes were lost by the intracapsular and seven by the capsulotomy method. By the former technic there was no instance of secondary cataract, by the latter twenty-four or 15.5 per cent.

## VITREOUS HUMOUR.

T. B. HOLLOWAY.

PHILADELPHIA.

This section reviews the literature relating to vitreous humor during 1917 and to May 1st, 1918.

**LOSS AND REPLACEMENT OF VITREOUS.**—In his experimental work with rabbits **Schreiber** found that removal of 1.4 ccm. of vitreous was well borne. In only 20 per cent of the cases did persistent detachment of the retina occur. As much as a total of 3.9 ccm. was removed as the result of five aspirations, and each time the eye refilled within twenty-four hours and the intraocular tension became normal within two or three days. Subsequently no notable microscopic changes were found. He believes that inasmuch as a man's eye possesses a decided capacity for spontaneous replacement, conservative treatment would seem to be indicated. He regards as unnecessary the refilling of the collapsed eyeball with isotonic salt solution.

**ABNORMALITIES.**—**Howard**, working in Verhoeff's laboratory, has made an exhaustive histologic and pathologic study of an eye removed from a five weeks old infant showing the following interesting features: The presence of

rod- and spindle-shaped as well as round granules in the pigment layer of the ciliary body and iris; indicating that the presence of the elongated form is not, as is generally supposed, a distinguishing feature of the pigment epithelium of the choroid alone. Continuity at the optic disc on the temporal side, between the two layers of the secondary optic vesicle, and absence of the medullary sheath of the optic nerve. A fibrous connective-tissue tumor of the pectinate ligament on the nasal side and absence of Schlemm's canal on the temporal side. Persistent pupillary membrane, associated with annular posterior synechia and entropion uvea, non-inflammatory in origin. Processes with zonular fibers from the posterior surface of the iris, and long retinal processes of neuroglia tissue extending into the vitreous. A fibrovascular sheath of the lens, associated with a persistent hyaloid artery and cortical cataract. Zonular fibers in various situations and in different stages of devel-



opment. Vitreous fibers appearing in various stages of development, the fibers arising from the fibrovascular sheath predominating and proving in a very conclusive way, it seems, that part of the vitreous at least has a mesodermal origin. The whole contribution shows careful work and may well be reviewed by all ophthalmologists whether or not they are particularly interested in this phase of their specialty.

**Zentmayer** observed a retained hyaloid sheath, that appeared as a white membrane that could be traced into the vitreous for some distance from the upper and inner quadrant of the posterior lens capsule. It again became visible more posteriorly as a greenish white mass attached to the disc. In the right eye of a young girl **Boyd** observed a fibrous band extending down and in from the disc.

**CHANGES FROM SEPTIC PENETRATING WOUNDS.**—This contribution from **Elliott** has evolved from his studies of *couching* of the lens as referred to in the chapter on the lens. He refers to the opinion of **Straub** that hyalitis is due to a chemotaxis following the deposition of septic matter in the vitreous, but believes that this fails to sufficiently weigh the importance of infection of the surrounding structures. In couched eyes the appearance found in the vitreous included slight gauzy films, filmy masses in the anterior part of the inflammatory foci therein, total detachment of the retina with inflammatory matting of all parts, and the remains after panophthalmitis. Detachment of the retina was found in 70 per cent of the cases, and this was explicable by the pouring of exudate into the vitreous chamber, adhesion of the exudate to the retina, and a shrinking of the exudate. He believes this pouring out of exudate into the vitreous is dependent upon a primary infection of the surrounding vascular coats rather than upon a chemotaxis from an infected vitreous.

**HEMORRHAGE INTO VITREOUS.**—**Appleman** has contributed a report on three cases of massive spontaneous hemorrhage into the vitreous, the ages

of the patients being forty, twenty-one and twenty-seven. In one case the Wassermann was positive, in another negative; while the third had a negative serum Wassermann but acknowledged a specific infection; he also had a positive gonococcus fixation test. The patient with the negative Wassermann had had three miscarriages, had an extensive pyorrhea, and albumin and casts in the urine. The author discusses the etiology and treatment of these cases.

In a woman aged 61, **Spencer** observed a large vitreous hemorrhage in one eye, the fundus of the other eye being negative except for tortuous vessels. The intraocular tension was eleven; the urine negative and the blood pressure not excessive. Wassermann and tuberculin tests were not made. **Robinson's** patient was a luetic male, age 50 years. He had had several attacks of hemorrhage, the first, three years before coming under observation. **Harrison** has referred to traumatic intraocular hemorrhage. He believes the prognosis is very favorable even in elderly individuals.

In a patient with recurrent vitreous hemorrhages, **Westphal** employed subconjunctival injections of thiosinamin and antipyrin with seemingly good results. He adopted the method of **Horeau** and **Michel**, 1 cc. of the solution containing thiosinamin 0.1 and antipyrin 0.0075. He began by injecting one-tenth cubic centimetre of this solution. He states that two injections a week are sufficient and that more than two milligrams of thiosinamin causes ocular irritation.

**ASTEROID HYALITIS OR SNOW-BALL VITREOUS OPACITIES.**—**Stark** has placed on record three histories detailing his observations concerning those interesting snow-white opacities that have been described under the title of asteroid hyalitis—more or less globular opacities that do not settle to the bottom of the vitreous chamber. Two of his patients were males, and in all the right eye only was affected. One patient had a positive Wassermann and in another this test was negative. After a review of the literature at his dis-

posal he was inclined to believe that syphilis played a role in the etiology.

Holloway has recorded four similar observations, bringing the total to thirteen; and with the cases of D'Oench and Argyll-Robertson to fifteen. Of the thirteen all were over fifty years of age but one. In two instances the involvement was bilateral, in seven the right eye only and in four the left eye. He believes these opacities are more prone to occur in elderly individuals, and probably as the result of a process analogous to that concerned in the production or deposition of cholesterin in the vitreous, or possibly as one of the stages in the same chemical process.

TREATMENT OF VITREOUS OPACITIES. —Peck, before taking up the treatment of vitreous opacities, briefly refers to the structure of the vitreous and to the etiology of vitreous opacities. He thinks synchysis scintillans is probably due to faulty pancreatic and hepatic metabolism. Careful refraction is of course advised in cases of myopia. As to hemorrhages in the vitreous, he advises rest in bed, salines, morphin and protective glasses, with appropriate treatment of the inciting cause; prolonged use of calcium chlorid being advised in recurrent hemorrhages. See Appelman and Westphal above.

## THE RETINA.

MARCUS FEINGOLD, M. D.

NEW ORLEANS, LA.

This part of the Digest includes the literature of the retina for the year 1917 and up to May 1st, 1918.

ANATOMY.—Krückmann considers as lymph passages around the capillaries of the retinal vessels the spaces which he demonstrated between the endothelial tubes and the membrana limitans gliae perivascularis.

ANOMALIES.—Botteri has written on anomalies of eye-ground in new born. Several cases of *opaque nerve fibers* are reported by Menacho. Some of these eyes showed congenital cataract. An unusually large rhomboid area of opaque nerve fibers in one case indicated by the striation a curved direction more or less concentric with the macula. A horizontal dehiscence in the nerve fibers, about one half disc diameter high, began about one disc diameter from the temporal margin of the disc and extended to the temporal edge of the area. The macula showed extensive destruction with localized accumulation of pigment.

Pringle's patient showed a large patch of medullated nerve fibers along the upper temporal vessels, some distance from the disc. A smaller one was situated about two disc diameters from the temporal side of the macula,

was less compact, and consisted of fine silvery threads.

The *optico-ciliary vein* in Herrenschwand's patient arose from the lower temporal margin of the papilla in the right eye, and in the left eye it came from the lower nasal border. Because pressure on the eye would empty the blood sooner from them than from the other retinal veins, Herrenschwand considered them rather anastomotic than independent veins.

Holloway's patient showed an optico-ciliary vein in the left eye only. As a small vessel it entered the inferior temporal vein between the exit from the papilla and disc margin. It described an S-shaped course and disappeared, at the nasal margin of the disc, into the choroid, where it could be followed for a millimeter or two. In color it corresponded to an artery.

A *loop of a retinal vessel* was shown in Feingold's patient, who presented a true Fuchs' coloboma or conus at the lower margin of the disc. A fold of retina, bridging over the staphylomatous sclera, formed a pocket into which the lower temporal vein extended in a



U-shaped loop, appearing veiled through the duplication of the retina. Similar cases have been reported by Coats and by von Szily.

According to **Pringle** the *aneurisms* found in each retina of his patient might possibly be looked upon as a congenital anomaly. His patient, a soldier of 23 years with normal vision, showed beside medullated nerve fibers in the left eye, several aneurisms in each retina. In the left eye the aneurisms all sprang from the lower branch of the upper temporal artery. The dilatations of the vessels were all placed close to one another. Some were small, others large; some were fusiform, others resembled the bulb of a Higginson syringe. In the right eye the inferior temporal and inferior nasal arteries showed dilatations, similar to those in the left eye, but much smaller, and in the extreme periphery and therefore difficult to see. These swellings are aneurisms and are filled with blood; the blood stream can be traced through the center. Pulsation can be produced by pressure on the eyeball. The veins had no connection with the aneurisms. See also retinal degeneration with aneurisms below.

In a paper illustrated by 25 drawings **Menacho** illustrates various anomalies observed by him concerning division, branching and distribution of the vessels, coiling of the veins around the arteries, ciliary retinal vessels, direction of the vessels to the nasal side, etc.

PHYSIOLOGY, CHEMISTRY AND PHYSICS.—**Kumagai** has written on the behavior of retina under chemical and physical stimuli. **Albarenque** examined the retina of *Didelphys Marsupialis* subspecies *Azarae*, a purely nocturnal animal. The retina was fixed in osmic acid or in Tellyesnick's fluid. Both teasing preparations and paraffin sections were made, and in all the absence of cones could be clearly demonstrated. That this absence of cones was not due to the faulty technic is proven by the fact that Albarenque found, by these same methods, cones in the retina of the rabbit. The fact that the retina of this nocturnal animal contains rods only, Albarenque considers as proof

enough to support the doctrine that rods are the organs for vision in darkness and cones the organs for daylight vision.

In continuation of some work on the retinal pulsation published in 1909, **Bailliant** is attempting to determine the arterial pressure within the eye. It is to the variable pressure and difference between the pressure extremes, systolic and diastolic, that the arterial pulsation is due. The moment the extra-arterial pressure reaches the height of the diastolic pressure the slackened arterial walls vibrate at maximum and the pulsation becomes visible. When the intraocular pressure is increased, as in glaucoma, or when the diastolic pressure is diminished, as in insufficiency of the aorta, the retinal pulse appears spontaneously. But most often it will be necessary to increase artificially the intraocular pressure, by pressure on the eyeball, in order to provoke the retinal pulsation. If the pressure on the eyeball be further increased, then the pulsation will entirely cease and slight gradual release of the pressure will make the pulsation reappear. To know the figures of the systolic and diastolic pressure it is necessary, therefore, to measure the pressure on the walls of the artery. This pressure consists of two factors, intraocular pressure and digital pressure on the eyeball.

Since the intraocular pressure can easily be measured, one needs only an apparatus to measure the pressure on the eyeball. Bailliant used the Bloch-Verdin sphygmomanometer. The individual to be examined is prepared for ophthalmoscopic examination, preferably by the indirect method, and the assistant, standing behind, applies the apparatus on the external commissure of the lids. When the first pulsation is noticed the manometer is read, then the assistant continues pressure until all pulsation disappears; the compression is gradually released until the reappearance of the first pulsation and again the manometer is read. Fifty soldiers were examined and the intraocular pressure was not taken, but assumed to be equal to 20 mm. In order to produce the first arterial beat, that

is, to counterbalance the diastolic pressure, an average pressure of 47 mm. was necessary. If to this is added the assumed intraocular pressure of 20 mm., this would then give 67 mm. for the diastolic arterial pressure. To counterbalance the systolic pressure (reappearance of first pulsation) an average pressure of 78 mm. was necessary, and adding to it the 20 mm. of intraocular pressure a systolic pressure of 98 mm. is found.

When the individual examined observes with this same eye a bright surface through a blackened tube, his visual field darkens from the nasal to the temporal side; colored lights disappearing in about the same time as white ones. The blindness is produced when the systolic pressure is overcome and the blood wave does not penetrate the arterial branches. The compressed eye sees the pulsation of its own arteries the moment when the counterbalanced diastolic pressure is followed by the appearance of strong beats. The pulsation becomes visible to the individual examined generally with a pressure of 40 mm. An average pressure of 69 mm. was necessary to suppress all sensation of light, but one must remember that the blindness only comes on a few moments after the necessary pressure has been used. The interval is of different lengths in different individuals. It will be interesting to repeat these experiments on patients with chronic glaucoma with comparatively normal tension. When spontaneous retinal pulsation exists it will be necessary to determine whether it is due to increased intraocular tension or to diminished arterial tension. In cases of increased intraocular tension without spontaneous pulsation, one will have to assume and search for a local arterial hypertension.

Dunlap made experiments to determine the shortest perceptible time intervals between two flashes of light on the same retinal area, that will allow the two to appear separately. It had been found before that the time-threshold became low as the lengths of the flashes were increased. Special apparatus was constructed. The net re-

sult of the experiments was to show the unreliability of determinations, on the dark adapted eye, for flash lengths less than  $1/10$  of a second. The threshold is low with light-adaptation. The chief value of these experiments lies in the complex psychologic conditions of the judgments involved. (See also Diagnosis, p. 4.) Lipkin has written on the influence of intermittent light on the retina, and Ruchnich on the study of visual rhythm.

Detwiler found that the contraction of the cones and the migration of the pigment of the tortoise and lizard is not abolished by dividing of the optic nerve.

Grünbaum has investigated the subject of ocular *fatigue* by comparing intermittent with constant illumination. The length of intermission could be varied, and the point at which it gave the effect of constant illumination was noted. He finds ocular fatigue to be a condition that is both central and peripheral, and that when one eye is experimented on the other also shows fatigue but less in degree.

SUBJECTIVE PHENOMENA. — Troland writes on the measurement of visual stimulation intensities, and Jones on retinal sensibility to hue differences. Luckiesh, investigating the Purkinje effect, found that the value of red and green light, obtained by him with the direct comparison method, for a wide range of illumination, was only 62 per cent of the value obtained with a flicker photometer. Weiss has written on the Purkinje experiment.

To study the effect of bright surroundings on foveal vision, Cobb and Geissler used a box approximating a sphere in shape, painted white inside and illuminated with an electric light through a milk glass. The observer's face fitted into a hole in one side of the box; and he could, through an opening in the opposite wall, watch the test fields 6 to 8 cm. in size about two meters from the eye. The conclusions are as follows: Different individuals may show fairly wide differences in the vision of objects of very low brightness, both with and without bright surroundings. The relative changes in



visual capacity caused by differences in surroundings were found to be on the whole in the same direction in cases of the same change in the conditions. For objects of relatively low brightness, the presence of a surrounding field of relatively high brightness has the effect of lowering the capacity of vision, both for details and for brightness-difference. Surroundings of a brightness about equal to or less than that of the test objects show, on the whole, no consistently better or worse results than dark surroundings with the identical test objects. Visual acuity under these circumstances was perhaps slightly improved. The difference threshold was apparently slightly increased while its diffusion was distinctly diminished. The ambiguity of the latter findings makes further work on the difference threshold desirable.

Ovio observed a red border at the edge of the black print after he had been looking at the country from the railway coach for some time. This illusion he explains in the following way: The eye possesses varying excitability for different colors and at times chromatic aberration of the eye may play a role in the production of the phenomenon. When light reaches the retina through the lids or sclera a sensation of red is experienced and, if lasting for some time, will slightly lower the sensibility of the retina for red. In this way white lights will produce a sensation of green, but black objects appear red as the after-impression of the red from the insolation, because the retina is not excited by the black and because the green sensation of white objects produces, by contrast, a sensation of red in the area of the retina upon which are depicted the images of the black objects.

An insolated eye has, therefore, from black and white objects the sensation of red on those parts of the retina where the light from the object looked at is absent or weak, and has the sensation of green in the regions acted upon by strong light from the object. With colored glasses it is also possible to have the sensation of the color of the glass

employed, and of the color complementary to it. The first sensation is received when the direct impression predominates; the second sensation when the individual succeeds in forming an abstraction from the direct impression. This way it is possible to see, through a colored glass, objects in their own color and, by paying close attention, it is also possible to see upon these objects, the color complementary to that of the glass employed. The red margin on black is presumably a special manifestation of these marginal chromatic phenomena which seem to be due to a different excitability of the eye for various colors; Ovio would explain it with a special tremor of the fatigued eye, analogous to the intentional tremor of the fatigued fingers and hands.

GENERAL PATHOLOGY.—The histologic examination of the right eye with subchoroidal hemorrhage, of a soldier struck by a piece of shrapnel, leads Collins to argue how such a condition would appear ophthalmoscopically. It will hardly show as an elevation but the retina will be whitish-opaque, because the hemorrhage between sclera and choroid compressing the choroidal vessels in that area would thereby impair the nutrition of the retina. It is probable that commotio retinae and holes at the macula may both result from temporary ischemia of the choroid by subchoroidal hemorrhage. Cutting of a posterior ciliary vessel will, as shown by the experiments of Wagenmann, disturb the blood supply in the choroid, and its ischemia will lead to a clouding of the retina to be followed by pigmentation of the retina and atrophy of the choroid. Extraocular rupture by concussion injury remains to be proven; but there is evidence that it may produce subchoroidal hemorrhage, and in this way, later pigmentation of the retina. Pigmentary disturbance in the macula after contusion may have a similar origin.

In the retina of his case of Essential Atrophy of the Iris Feingold (169) found a 1.5 mm. area at the temporal margin of the disc in which the ganglion cells were entirely absent; here

peculiar bodies much larger than ganglion cells were found, of various shapes and often showing long thin processes. They were surrounded by clear places, bridged over by fine threads. These bodies were found only in this region, and the balance of the retina was practically normal. These bodies may be interpreted as either varicose nerve fibres, or as the peculiar changes found in the ganglion cells of the retina by Schreiber and Wengler. The influence of the toxins from the destruction of the iris may be held responsible for the changes in the retina.

**THERAPEUTICS.**—**Ridley** found injection of normal or hypertonic saline solution with the addition of 1/5000 cyanid of mercury for antiseptic reasons, 15 to 20 minims into the orbit along the outer wall, beneficial in various forms of retinitis; tubercular, luetic, pigmentary degeneration, etc.

**LEUKEMIA.**—Whether the white spots found in the retina in patients with leukemia really are leukemic new-formations is still under discussion. This view is strongly held by Meller and was endorsed by **Koyanagi** in a recent paper (*Y. B. v. 13, p. 203*). He now quotes the following case in confirmation of it: A man, aged 24 years, died of simple lymphatic leukemia fifteen months after the first symptoms. About six months before death he first complained of dim vision of the right eye; and in the macula above and to the temporal side of the disc there were several small retinal hemorrhages. No white spots could be seen at this time. No further ophthalmologic examination was made, but the bulbi at the autopsy were fixed in Zenker's fluid for histologic examination.

This showed in the left eye a circumscribed tumor-like swelling above the disc; an accumulation of medium sized lymphocytes and no admixture of red blood cells. The accumulation lies in the nerve fiber layers; the blood vessels are not dilated and show no pathologic changes. There is absolutely no outlining of the focus by red blood cells. A similar but much larger focus in the macula contains a hemorrhage in the center. Varicose nerve fibers and perivascular

lymphocytic aggregations are seen here and there. Small hemorrhages with a few leucocytes are disseminated almost through the whole retina. No focus behind the lamina cribrosa.

In the choroid was a moderate extravascular infiltration. Right eye shows the same changes but the accumulations were smaller, never forming a tumor-like swelling, but the choroid was much more affected. The leucocytic aggregation in this case cannot be looked upon as the result of varicose dilatation of the blood vessels, as in other cases, nor the result of an extravasation of lymphocytes. **Koyanagi** assumed that the lymphocytes grew exclusively at the place where they congregated in the adventitia of the blood vessels. In the macular focus with a central hemorrhage he assumes the lymphatic aggregation to be due to a perivascular hyperplasia and the hemorrhage as a consequence of this infiltration of the vessel walls.

**RETINAL CONDITIONS FOLLOWING INJURY.**—**Frenkel** reports and illustrates peculiar changes in the retina of a soldier's right eye, which he attributes to the effect of windage, i. e. the compression of the eyeball at several points of the orbital walls during the time the eyeball was pressed in by the explosion nearby. The **Wassermann** had been found positive eleven months before when foci of chorio-retinitis were seen in the lower part of the retina. Under treatment vision improved. About one year later **Frenkel** saw the patient for the first time and found a slight detachment of transparent retina above the disc; and in the lower macular region a whitish line, concave upwards, with a reddish reflex on the convex side; macula normal. In the upper periphery were two, and in the lower periphery, three large, more or less round or oval white lines, enclosing almost normal retina or areas with whitish spots and whitish discoloration. These round areas **Frenkel** attributes to the impact of the eyeball on the bony walls of the orbit by the bursting shell two meters away. **Purtscher** has again written on traumatic retinal angiopathy. (*See Y. B. v. 10, p. 351.*) See also obstruction of retinal vessels.



**ARTERIAL PULSATION.**—The pulsation of the retinal artery in **Holloway's** two patients was due to cardiac and vascular disease. One patient had aneurism and aortic murmur, the other had mitral and aortic disease. In the discussion importance is emphasized that patient, ophthalmoscope and observer be absolutely steady, otherwise pulsation may be simulated; patient and observer are to rest their arms on a table. A case is reported in which a pin-point corneal opacity produced the impression of artery pulsation.

Pulsation of small arteries in the retina of **Wolff's** patient was due to aortic regurgitation. In the discussion **Weeks** relates that his patients with heart disease often complain that vision becomes diminished on exertion. **Weeks** considers it due to temporary increase of intra-ocular tension.

**ANGIOSCLEROSIS.**—While acknowledging the monumental work done by **Marcus Gunn** in establishing retinal signs of arterial sclerosis, **Bardsley** believes that these cardinal signs do not necessarily indicate arteriosclerosis, but are often due to some accessory cause. The following are to him the signs of high arterial tension and those of angiosclerosis. (a) Tension: vessels are uniformly distended, the light streak is broader and much brighter, often being like copper wire; arteries indent veins. (b) Sclerosis: irregular tortuosity, light streak more brilliant and narrow, irregular caliber and beading, diminution in size of vessels and silver wire reflex.

High tension and sclerosis frequently coincide, but not always. Blood pressure is raised by toxic infection (teeth), and the signs disappear with elimination of the pressure and the cause. Silver wire sclerosis never changes. High blood pressure, as from aortic disease, may last a lifetime without vascular sclerosis. Experiments with adrenalin to raise the blood pressure confirm his views; and he believes that an approximate estimate of the blood pressure can be arrived at by observation of the retinal blood vessels, of the amount of indentation and of the brightness of the streak.

Certain pitfalls must be avoided. (1) Errors of refraction which blur the de-

tails. (2) In severe toxemias the retina would show broad arteries, increased light streak, engorged veins with slight indentation; but all of these symptoms are due to the toxins and disappear when the blood pressure improves after small doses of digitalis. (3) Failing heart in prolonged high tension and sclerosis.

In an excellent paper full of details and accompanied by illustrations and drawings, the evidence of close and persistent examination, **Moore** attempts to create the picture of *retinitis of arteriosclerosis* and to establish its relation to renal retinitis and to cerebral vascular disease. Retinitis of arteriosclerosis is a separate clinical entity, distinct from renal retinitis. In arteriosclerotic retinitis the sclerosis of the arteries precedes the exudate and is well marked. In renal retinitis, on the other hand, vascular disease is less marked and the other manifestations of retinitis are present. Retinal hemorrhages are smaller and more scattered than in renal retinitis. In arteriosclerotic retinitis exudates are white dots, or spots, are sharply defined, and as a rule scanty. They develop slowly and change slowly; they disappear without any trace. Some patches are larger but have a hard edge, are dirty white and irregular in outline. Patches of soft edged exudate (wool, cotton wool, snow bank, etc.) are rare in arteriosclerotic retinitis, and are probably evidence of renal insufficiency.

In arteriosclerotic retinitis edema does not occur and detachment is rare. Star figure may occur in either. Arteriosclerotic retinitis is often unilateral; renal retinitis seldom unilateral for more than a few days or weeks. Subjects with arteriosclerotic retinitis may often live a number of years, and the death is referable to disease of the vascular system and not to disease of the kidneys. Of 44 patients with cerebral lesions 31 showed retinal vascular disease, 19 of very severe degree; 27 died, causes of death known in 26; 12 of these had vascular cerebral lesion. Of 46 patients with severe retinal vascular disease, 21 had suffered from a cerebral lesion or developed one in the course of about three years.

Urging cooperation with internists when even the first stages of arteriosclerosis in the retina are discovered **Wright** divides the changes in three stages. 1. Dilatation of vessels: presclerosis; 2. Contraction and local changes in vessels: established sclerosis; 3. Exudates, hemorrhages, edema, etc.: end results of sclerosis. First stage: bright streak is broader and brighter, vessels are tortuous, changes in small vessels first, in one eye only; arterial pulsation. In the second stage minute opaque spots break the continuity of the central stripe; fine white lines along the artery, later opaque spots or lines surround the vessels that are now contracted, silver wire, arteries indent veins. Last stage: edema, hemorrhages, etc.; but already general systemic disturbances are seen.

Enumerating the symptoms of retinal angiosclerosis, **Moulton** cites three cases illustrating their prognostic significance. (1) A woman of 70 years showed in the right eye a small retinal hemorrhage and floating filaments in vitreous; vessels whiter and less distinct. Six months later hemiplegia, and death one year after. (2) A woman of 48 years with syphilitic angiosclerosis showed hemorrhages in right vitreous. After proper treatment again normal vision and restored general health. (3) A man, 52 years old; Menière disease from bleeding in right labyrinth; sugar in urine, blood pressure 180; vision below normal; compression of veins by crossing arteries well marked. Diabetes the cause of vascular disease in this case. Patient still alive, well. **McCaw** demonstrated a patient with retinal arteriosclerosis in whom Jackson had found newly formed retinal vessels.

**VASCULAR DISEASE AND PROGNOSIS AS TO LIFE.**—**Adams** endeavored to trace the final history of patients with vascular disease of the retina. Data of about 124 cases were collected. Retinal lesions are more common in women than in men. They are not altogether due to pregnancy since almost one-third of the cases have been in unmarried women. The older the patient the better is the outlook as to life, regard-

less of the presence of albumin in the urine. The presence of albumin in the urine makes the prognosis still worse in the young.

**RETINAL HEMORRHAGE.**—**Genet** reports a case of retinal hemorrhage during hemoglobinuric bilious fever, in a soldier of 27 years stationed in the colonies. In 1916 he developed a first attack of hemoglobinuric fever; on return to France a second attack; repeated vomiting and jaundice; urine showed albumin and hemoglobin. During recovery patient complained of blurring of the left eye. In the left eye hemorrhage in the macula bounded above by a horizontal line passing through the center of the macula with a lower semicircular border; a small, dot-like hemorrhage along the inferior temporal artery. In the right eye a very small dot-like hemorrhage in the macula near the center.

**Amsler** again writes of the etiology of hemorrhagic retinitis, (*Y. B.*, v. 13, pp. 203, 206, 209).

**RETINAL TUBERCULOSIS.**—**Finnoff's** patient, a ranchman of 28 years, showed small deep-seated infiltrations in each cornea, and in the fundus greyish exudate was covering some of the veins and one artery. Later small hemorrhage showed in the right eye. Wassermann, urine and teeth negative. Irregular haziness over the veins showed up after tuberculin injection and is apparently a focal reaction. Patient had a cow which was suspected of tuberculosis; was given bovine tuberculin and gradual improvement resulted.

**Spencer** reports three cases of tuberculosis: (1) A man of 32, whose left eye was failing for three months. Vitreous was hazy, the disc hyperemic; many hemorrhages about the retinal vessels with area of retinal proliferation. Luetin test negative, but decided local and general reaction after old tuberculin. Patient declined treatment. (2) A woman of 27 years, vision of left eye reduced to light perception with good projection. Massive hemorrhages in the left vitreous and details of the eye-ground could not be seen. Active tubercular lesion in the right apex. (3) A man of 20 years; left eye inflamed



for a few days, objects looking smoky. Fresh blood in the vitreous made it impossible to see retina and disc. Disc looked red; local and general reaction to tuberculin.

**Bane** reports two cases: (1) A man of 22 years; poor vision right eye three days; several hemorrhages in vitreous. Under potassium iodid vision improved to 5/6, and vitreous was clear. Soon the vitreous again became hazy, and the disc indistinct. Was given 10 grains calcium lactat, and K. I. continued, but in smaller doses. (2) A man 21 years old; three years before poor vision of right eye, vitreous hazy. Was given iodid; gradual improvement until one year later when he developed left psoas abscess, finally vision failed so that now he can only see hand movements. Grayish black mass in vitreous; von Pirquet negative, and bovine tuberculosis, but subcutaneous injections of tuberculin positive.

**Lansdale's** patient, a man 22 years old, had blurred vision of the left eye one month. Vision 20/200; hemorrhagic retinitis. In the discussion this case is declared to be probably one of tuberculosis of the retinal vessels. In discussion Jackson reported a case with hemorrhage in the macula giving a focal reaction from tuberculin.

**Black's** patient, a man of 23 years, showed a massive exudate in the nasal part of the retina of the left eye; and, preceded by hemorrhages, later also in the same place in the right eye. Tuberculosis suspected. General and focal reactions could be produced by large enough doses of tuberculin.

**Wallace's** case, a man 33 years, suddenly lost the vision of left eye. Disc hazy, elevated; veins unusually large; small hemorrhages about the disc; on nasal side of the macula round white spots. Jackson finds the case suggestive of tuberculosis of the retina.

**RETINITIS PROLIFERANS.**—**Week's** patient, a man of 44 years, had poor vision for ten years. Two desperate attacks of retinal hemorrhage one month apart; each attack reduced vision to light perception. Only partial restoration of sight. Examination showed signs of old central choroiditis. Nar-

row bluish-white bands follow the vessels out from the disc and swing forward into the vitreous.

**Findlay's** patient with retinitis proliferans was in healthy condition; no causative factor could be found and in the discussion the diagnosis of exudative retinitis was suggested.

**Wallace** reports proliferating retinitis in a man 26 years whose vision became impaired four years ago. Football injury to the head some years before. Proliferation of vessels in places.

In **Ischreyt's** patient, a man of 29 years with lues, the arteritis and periarteritis lead to obliteration of vessels, and formation of connective tissue in the vitreous, of the character of retinitis proliferans, in both eyes. The arc-like figure surrounds a small pigment focus on the nasal side. Posterior synechia and pigment on anterior capsule.

The case of central recurrent retinitis which **Hirschberg** has had under observation for twenty-seven years, has shown frequent recurrences and has responded well to antiluetic treatment. A parafoveal focus remained after one attack; and bluish infiltrations subsequently appeared in this neighborhood, suggesting a partial blocking of the blood at the old focus. A scotoma with full central vision finally resulted.

**EXUDATIVE RETINITIS.**—In **Crigler's** patient, a girl of 14 years, with hereditary lues, the retina was elevated unevenly as far as the equator; at the anterior border of the elevation were small hemorrhages and one or two amputated veins. In the lower temporal periphery an area of chorio-retinitis with small hemorrhages; retinal vessels distinct until they reach the periphery. The massive exudation occupies all except the lower nasal part where the background presents a silver white appearance with cholesterine crystal deposits in different parts of the retina. In the discussion the case is declared to be one of massive exudation of Coats.

**Ischreyt's** patient, a woman of 60, showed a grey opacity which, beginning 2 disc diameters above the right disc, turned arc-like to the macula and seemed folded. The artery crossing it

is tortuous, the vein runs smoothly. A similar condition in the left eye. Ischreyt considers the folds in the retina due to an exudative process in and behind the retina: a kind of exudative retinitis. The macular changes are possibly senile.

**van Schevensteen's** patient, a soldier with *ictero-hemorrhagic spirochetosis* showed, during convalescence, left vitreous opacities; later a patch of chorio-retinitis in the periphery of the right and left fundus; hemorrhages about the diseased area. Choroido-retinitis ultimately appeared in the course of resolution and no vitreous opacities. In one other case mentioned by him he found no fundus changes and in a third case signs of a past iritis.

**SYPHILIS.**—**Fuchs'** case of central recurring syphilitic retinitis was noticed last year. (See Y. B., 1916, p. 215.)

According to **Masuda** recurring central retinitis is very common in Japan; no fundus changes are present, vision decreases and central scotoma is noticeable. With the Thorner ophthalmoscope very minute changes in the pigment epithelium and slight edema of the macula can be seen.

#### OBSTRUCTION OF RETINAL VESSELS.—

**MacKenzie's** case is very interesting on account of the diagnosis. A woman of 59 years found the vision of right eye failing, suddenly, 10 days before. The upper half of the right disc showed a translucent bluish-white pendulous swelling, giving the impression of a blister ready to rupture. Edema extended from the disc onto the retina, and was circumscribed by the two superior arteries. On the temporal side of the disc, the fundus was pale, salmon colored. Radial hemorrhages all over; veins dilated and tortuous; arteries somewhat narrow. Within a few days vision improved to normal, edema became less marked and the veins of the disc narrower than in the periphery. Hemorrhages began to clear rapidly and gradually reduction in the size of the upper arteries was noticeable. Still later a tuft of snow-white exudate about 1.5 disc diameters above disc could be seen. Between it and the disc the artery was barely visible, be-

yond it, it appeared red, but like a thin twisted tape. MacKenzie looked upon his case as one of coexistence of occlusion of the superior branches of the central artery with occlusion of the accompanying veins for the following reasons: That occlusion of the veins existed is evidenced by the typical hemorrhages throughout the fundus, by the dilatation and tortuosity of the veins; that occlusion of the artery existed is revealed by the edema of the optic nerve, by the pallor of the fundus, by the narrowing of the upper branches, and by the subsequent atrophy of the upper half of the disc. The total blindness of the lower field and the preservation of the upper, indicated a graver lesion in the upper half of the retina. Since the whole retina showed signs of occlusion of the veins the defect of the lower field must be due to the obstruction of the upper arterial branches. Coexistence of occlusion of the arteries with occlusion of the veins has been reported by trustworthy authorities and has been found more often in the branches than in the main trunks of the vessels.

**Ring** has reported sudden obstruction to retinal circulation in cardio-renal disease. (Y. B. v. 130, p. 205.)

Thrombosis of the superior retinal veins apparently one year old, was present in **Krauss'** patient, a woman of 48 years with high blood pressure and latent lues. The thrombosed section was replaced by innumerable fine corkscrew-like vessels surrounding the opaque area of the retina. A macular vein showed enormous dilatations. This collateral circulation possibly explains the almost perfect field and good central vision.

**Hoover** reports two cases of embolism of the central artery. (1) A man 65 years old could not see with his left eye one morning; once or twice previously he had noticed dimness of vision of that eye. Tension was increased, pupil dilated and irregular; vessels whitish, retina grey-white; optic nerve atrophic. (2) A woman of 32 years had headaches for about ten days, then fell unconscious. That afternoon the left eye was blind. There was whit-



ish opacity of the retina; increased intraocular tension and pale disc; but slight improvement of vision.

**Okayama** reports a retinal embolus at the macula of a woman, followed by pigmentary changes. These the author believed were due to serous separation at the fovea. **Rönne** has written on thrombosis of the central retinal vein, and **Kraupa-Runk-Teplitz** on embolism of central retinal artery.

Of *traumatic thrombosis* of the retina **Cozzoli** could find in the literature only the cases of **Wiser** and **Weinbaum**. His patient, an officer of 26 years, struck his left temple against a piece of furniture. Next day there was disturbance of vision of the left eye in the upper temporal quadrant of the field. Retinal arteries were reduced to fine threads; veins were wide from periphery towards disc, where they suddenly diminished in caliber. There were numerous hemorrhages, and vision 1/10. The second pulmonary sound accentuated; the radial hard. There was a trace of albumin in the urine; blood pressure 145. Diagnosis: Thrombosis of central retinal vein in lower nasal branch, in a subject with arteriosclerosis. Later areas of chorio-retinal degeneration developed. Subconjunctival saline injections were followed by subconjunctival hemorrhage in all places of injection. Vision ultimately became 1/20. Lues negative.

**RETINITIS IN PREGNANCY.**—According to **Chance** the retinitis of pregnancy is dependent upon the process that produces the acute nephritis, and is not to be considered to be albuminuric but is toxic. Chronic nephritis may be present before the pregnancy, or acute renal retinitis may develop during pregnancy. The nephritis of pregnancy is not a true inflammation, but a degeneration of renal epithelium. In some cases chronic nephritis may follow. Ophthalmoscopically neuro-retinitis with exudation and hemorrhage is seen. In eclamptic cases evidence of retinitis is rare. Prognosis is usually good, but dependent on the lesions and whether or not pregnancy can be terminated. The prognosis as to life is

much better than in nephritis of the nonpregnant. Spontaneous premature delivery shows 11% mortality; in artificial delivery the mortality is 4%. Early examination of the eyes of all pregnant women must be practiced, to reduce the mortality and to prevent affections of the eye.

**Kollock** relates the case of a mulatto woman with typical albuminuric retinitis of pregnancy who had no trouble in a subsequent pregnancy.

**RENAL RETINITIS.**—The retinal changes in chronic Bright's Disease, **Vandergrift** divides in two groups; one where exudation is the prominent symptom, and the other where arteriosclerosis is the main feature and retinal exudation is only slight. The exudation in the retina is an edema of the inner layers, mostly near the disc, and is similar to the dropsy in other parts. There is no inflammation and no degeneration. In retinal arteriosclerosis, on the other hand, small white spots are found in the macula and scattered about the retina. The macular arteries have a corkscrew appearance; veins are flattened by the crossing arteries; the light streak on the arteries may be wider; periarteritis and vascular obliteration follow; finally we meet spasm of arteries, embolism, hemorrhages, and optic atrophy. Embolism of the retinal vessels is frequently a forerunner of cerebral complications. The flame-shaped hemorrhages are an expression of severe toxemia, due to chemical changes in the blood and not in the vessel walls. **Vandergrift** emphasizes that the form of the retinal manifestation furnishes an index to the clinical type of the renal disease, and that the ophthalmoscopic examination is of inestimable diagnostic and prognostic value as to the kidney and the general circulation.

Among the patients affected with war nephritis **Evans** found changes in the fundus in 57%; involvement of optic nerve and retina in 39, and of the choroid in 34 cases. The affections of the optic nerve and retina were mostly slight. Only once was there neuro-retinitis of albuminuria, in a man of 56 years with chronic Bright's disease.

Fine dotted changes in the macula were seen in four cases. In 18 cases depigmentation was found near the equator, at times as yellowish streaks with slightly pigmented borders; 12 cases had discrete orange-colored spots, of the type of disseminated choroiditis; 2 showed areolar choroiditis of lues, and 5 had guttate changes in the macula. Five cases showed slaty slightly raised discolorations near the macula and the retina over them sheeny; these are suggestive of small choroidal hemorrhages or thrombosis. All changes point to a toxic or infective origin; they resemble changes found in advanced age. The nephritis is of the type which follows scarlet fever and it is possible that the changes are produced by infective elements. Lues was found in only two cases. Oral sepsis could not be blamed as the cause of the nephritis and the fundus lesions.

In spite of the rather severe type of trench nephritis in the soldiers examined by **Kirk**, no exudation or nerve involvement was seen at first. These showed up only later, the star-figure was always absent and hemorrhages not common; these were punctate and not flame-shaped. He could watch the absorption of some of the patches. **Kirk** believes these changes are due to a specific toxin and that the condition is probably allied to the retinitis of pregnancy, scarlatina, etc., and not to the retinitis of chronic nephritis.

**Machwitz** and **Rosenberg** believe that the albuminuria showing neuro-retinitis is caused by a renal affection leading to azotemia. It is a symptom of lesion of the glomeruli and when present means malignant sclerosis and that the patient cannot live over two years. The amaurosis of eclampsia is due to uremia and the eyegrounds are normal excepting for occasional edema of the discs. Prognosis is good and improvement follows lumbar puncture. In rare cases neuro-retinitis is present. The pseudoremic ocular disturbances oc-

cur only in kidney sclerosis, are extremely transitory and depend on arteriosclerosis of the cerebral arteries.

**Dolcet** also writes on renal retinitis.

**Erggelet** reports a case of polycythemia with nephritis and normal eyegrounds.

**TOXEMIA.**—**Jessop's** patient, a boy of nine years, suddenly lost the sight of his left eye; papilledema was found. Beneath the vessels was a large mass of yellowish white effusion extending downward to the periphery, upwards to the superior temporal vessels, and externally to 5 disc diameters from the optic disc; height of swelling 1.6 mm. Near the yellow spot was a raised white swelling with vessels over it. The heart, lungs and temperature were normal, no albumin or sugar in the urine. Lumbar puncture gave clear fluid, no pressure. Gradually the white areas in the macula were replaced by white spots. Though meningitis was in the same ward, the case was decidedly not one of meningitis.

**DIABETIC RETINITIS.**—Of 100 ocular affections of diabetes 19 to 23 are affections of the retina, according to **Lo Cascio**. Three forms are to be found: the punctate retinitis of **Hirschberg**; the hemorrhagic and the mixed form which is the most frequent. Whitish shiny foci in groups in the macula characterize the first form; at times the macula free with spots around; and only rarely a star-shaped figure. Differential diagnosis at times is difficult, because diabetes may be accompanied by nephritis; but vitreous hemorrhages are more frequent in diabetes and retinal vessels more affected in albuminuric retinitis. Small punctate, or large deep red hemorrhages from capillaries and veins, not arteries, are typical for the hemorrhagic form. Punctate hemorrhages at times, only accidentally are found. Hemorrhages into the vitreous are accompanied by severe disturbance of vision.

*(Continued next month)*



# DIGEST OF THE LITERATURE.

## THE RETINA

MARCUS FEINGOLD, M. D.

NEW ORLEANS, LA.

(Continued from June issue)

The mixed form is most frequent and shows white spots  $\frac{1}{4}$  to  $\frac{1}{2}$  disc diameter, never forming large spots as with albuminuria. Diabetic retinitis always arises in individuals suffering at some time from diabetes. The disturbance of vision may be the first symptom of the undiscovered diabetes; the cause of the retinitis being still unknown. Treatment of underlying conditions may be essential as with potassium iodid and sodium salicylat. Thrombosis of central vessels, and irido-choroiditis with glaucoma necessitating enucleation, may be caused by diabetes. In extreme lipemia of the retina the vessels appear whitish. Microscopic examination will show fat droplets in the retina and choroid.

As forms of diabetic retinitis **Shafer** distinguishes the punctate, the hemorrhagic, the mixed type, and lastly the albuminuric retinitis in the eyes of diabetics.

**Wootton's** patient, a man of 53 years, suffered from diabetes for 5 years. Failing vision of left eye for 5 months. At the disc a greyish white mass larger than the disc protruding 2 mm. into the vitreous; two small hemorrhages above. Left eye typical diabetic retinitis.

**DRUSEN.**—The left eye of **Waardenberg's** patient, a girl of 21, had poor sight for some years. The disc edges were indistinct. From the center of the disc a white tissue mass extended downward, covering part of the inferior temporal artery for a little more than one disc diameter. At the lower nasal border of the disc was seen an area about 4 to 5 disc diameters, china white, with non-pigmented margins. The surface was not elevated; but slightly uneven, as if due to small elevations and furrows between them. The field showed an absolute paracentral scotoma corresponding to the papillo-macular bundle and disc, larger

than the retinal focus. Von Pirquet and Wassermann reactions were negative. Later there was fresh swelling of the disc and retinal hemorrhages. Because the scotoma was larger than the retinal focus, because it extended to the macula, and because of the hemorrhages that later showed up in his case, **Waardenberg** feels that a retro- and intrabulbar neuritis had been present in his case; and that the "drusen" in the retina had by compressing the nerve elements further increased the field defect.

**ANGIOID STREAKS.**—Both eyes of **Heed's** patient, a boy of 18 years, showed a number of dark brownish streaks, branching freely and rising from pigment rings around the discs. There were no hemorrhages. **Wassermann** and tuberculosis reactions were negative. In the discussion **Zentmayer** favors the view of the vascular nature of the streaks.

**RETINITIS PIGMENTOSA.**—**Kirkpatrick's** 15 cases of retinitis pigmentosa were in a very large percentage of the cases the offspring of first cousin marriages. Twelve eyes were trephined. By this 5 were improved as to vision and night-blindness or both. Of the other 7 cases, 4 were blind before the operation.

**Sedwick's** case of pigmentary degeneration was in a man whose vision failed gradually. The fields were contracted and retina and choroid involved. In the discussion the opinions about the classification of the case were divided.

**Jones** believes that the disease is due to pluriglandular deficiency of the ductless glands, which may be impaired in varying degrees; and that in some of his patients 1 grain thyroid extract, three times a day, in connection with arsenic and strychnin has shown an arrest of the downward tendency of the disease.

**OTHER RETINAL DEGENERATION.**—**Agañaraz** reports the case of an Arabian, 20 years old, with high myopia. Family history and Wassermann were negative. Complaints began when ten years old. The retina shows two entirely different portions: the first one surrounds the staphyloma and the posterior pole, and is like a dark red blanket without any choroidal details. A margin of regular arches sharply separates it from the peripheral portion where the fundus is yellowish white, because of the entire atrophy of the choroid and retina. Here pigment in irregular form is abundant, and the choroidal vessels are seen as white cords. The field is concentrically contracted. Agañaraz considers his case as a variety of atypical pigmentary degeneration.

**STRIPED ATROPHY OF RETINA.**—In a normal eye **Ochi** found in the upper and lower parts long atrophic stripes behind the ora serrata and parallel to it. At these points the retina was adherent to choroid.

**Zentmayer's** patients, a sister and brother, 10 and 9 years respectively, presented an unusual type of familial retinal degeneration. Throughout the retina were white or yellowish disciform lesions, mostly discrete, in places confluent. The parents were not related, and there was indication of heredity. Wassermann and von Pirquet were negative.

Among workers in naphthalin **van der Hoeve** found four out of six presented evidences of retinochoroidal changes. **Ginestous** proved retinal lesions following antityphoid vaccination were merely coincident. **Stilwill** saw a boy with neuroretinitis probably due to accessory sinus disease.

**AMAUROTIC FAMILY IDIOCY.**—**Bernstein** believes consanguinity has nothing to do with the disease; because though first cousin marriages are frequent among Jews, idiocy and cerebral degeneracy are not characteristic of the race. In certain African tribes intermarriage is even more close. The degeneracy is due to the terrible economic conditions of the Jews in Russia.

**Bernstein** reports two cases in the same family.

**Epstein** emphasizes that ophthalmoscopic examination is essential to proper diagnosis, and reports two cases in the same family. The parents are Russian Jews and first cousins. There was no lues, tuberculosis or alcohol in the causation. The children were the sixth and seventh in the family.

Amourotic family idiocy is a recessive condition, **Brandeis** maintains, and for this reason, given the consanguinity of the parents, it is a reasonable Mendelian expectation that the two patients of Epstein should have been the only children in the family to show the disease.

**Rand** saw two cases, children of Russian Jews, the parents in neither case being related. The one is possibly one of three children with the same disease in one family; the other one, over one year old, is still living, but has failed rapidly in the last three months.

**Welt-Kakels** reports of an infant of about eleven months with the usual picture. The spinal fluid of the patient was injected into an animal; and brain and spinal cord thereof examined showed no changes.

**Leonard** reports two cases: 1. A boy 17 months old, of Jewish parents, the second child; parents not related; pupils reacted and there was no fundus examination. 2. A girl, 15 months old, of Jewish parents, apparently not related. The fundus was typical.

**McHenry** reports nine cases, all of Jewish parents, that were not related, excepting in one instance where the grandmothers were third cousins. All cases showed negative Wassermanns. He believes that many cases are not reported or diagnosed.

**Tyrell's** patient, a child of 9 years, with negative history, showed a small circular area of densely powdered pigment in each macula, surrounded by a ring of scattered pigment spots; discs pale. Normal mentality. No change during 1½ year's observation.

**SOLAR RETINITIS AND SCOTOMA.**—**Lundsgaard** reports the good results of warnings sent out by the Ophthalmological Society of Copenhagen not to



observe the eclipse of the sun with unprotected eye. After the eclipse of 1913, 143 cases of scotoma were collected. In consequence of the warnings appearing in all the newspapers before the eclipse of 1914, only one case was reported and that in a man who had never read a paper.

**DAZZLING.**—**Holloway's** patient, a lieutenant, complained of eyes painful, injected and lids burning. After correction of the compound astigmatism and after discontinuing aviation work discomforts continued. The patient resumed his aviation duties in the fall and was comfortable with amber glasses. No perimetric examination was made.

**LESIONS OF THE MACULA.**—**Chance's** case of *hole at the macula* after explosion, showed a number of hemorrhagic areas, diffuse edema of the retina and a circular pigmented area 2 disc diameters were found below the hole.

**Burkholder** reports a case of a negro soldier, 27 years old, who received a blow on the right eye when a boy. In the macula was a hole, slightly larger than the disc, with sharply marked pigmented margins and deep red, mottled floor; with a few crystals of cholesterin on the floor; and central scotoma. **Mack's** patient with hole in the macula was struck in the right eye with a cork six years before.

**Ischreyt** reports the case of a woman of 74 years whose left macula was encircled by a ring-shaped detachment of the retina. Retinal vessels apparently do not cross this area. The choroidal vessels were sclerotic. It was impossible to decide whether the retina was totally detached at this place, or if there was only cystic detachment of certain layers. Possibly the cause was thin exudate. **Masuda** has reported a case of central chorio-retinitis.

**RETINO-CHOROIDITIS JUXTAPAPILLARIS (JENSEN).**—**Puiggari's** three cases showed stationary, typical, absolute scotoma, the result of infiltration close to the disc. Syphilis and tuberculosis do not seem to be causative factors.

**Martin's** patient, aged 19, noticed suddenly nebulous vision of the left eye. An infiltration like a mound of

white snow at the upper outer quadrant of the disk partly obscured the vessels. The typical scotoma was present with normal central vision. Soon a stellate hemorrhage appeared around the cherry-red macula. Hemorrhages disappeared after three days; vitreous opacities persisted longer. Finally: scotoma extending from the atrophied area to the periphery and greatly reduced central vision. Anemia, tuberculosis, malaria and lues negative. **Martin** emphasizes the importance of field examination and that the possibility of focal infection must be considered.

**REVERSE SEEING.**—**Bargy** relates the statement of a young woman that, while studying for examination and reading at night with poor illumination, she experienced repeated attacks of seeing all letters reversed. These attacks never returned after examination. The patient was looked upon as not being well-balanced and later had hysteriform attacks. In connection with this he quotes from the *Memoirs of George Sand*: "My vision was so used by the night watches that I saw all objects reversed and especially these rows of bridges which presented themselves before me as arches turned over on their bases."

**VON HIPPEL'S DISEASE.**—**Okayama** reports the second case in Japan, in a man 24 years old. In the left eye was an intensive whitish grey exudate with detachment of the retina on which ran bizarre retinal vessels in an irregular manner; and in one spot a reddish ball. The right eye, though still having good vision, showed in the region of the papilla a dark red conglomeration of vessels, and in the equatorial region similar large roundish formations. Arteries and veins entered into the formation of these masses, but were different in size and color. White spots appeared in various places.

The patient of **Ischreyt** noticed dark spots before his eye. This **Ischreyt** explains as due to a sudden impediment in the arterial current, by the retinal glious new-formation. With the compensatory arteries the disturbance gradually subsided. Improvement was not lasting because of fresh vitreous

opacities. The intense ectasia of the vein was possibly due to thrombosis at the papillary end.

**RETINAL DEGENERATION WITH ANEURYSMS.**—**Abe** and **Sugumuma** report a case of degeneration of the retina with multiple aneurysms in a 16 year old girl. In the left macula and at the periphery were large white spots of degeneration, and irregularly distributed aneurysms. Cause unknown. **Pringle's** case of multiple aneurysms of retinal arteries, without retinal degeneration, has been referred to, p. 102.

**Jenning's** patient, a man 21 years old, had defective vision of the left eye for two months. The macula showed brilliant white dots, spots and lines in a circle; and on the temporal side of it in a semicircle suggesting albuminuric retinitis or retinitis circinata. Retinal veins suddenly widen some distance from the disc. Eighteen aneurysms are seen on the different arteries. The larger aneurysms have a bright central reflex. No appreciable changes in three months. The condition is considered the result of local inflammation and degeneration of the retinal vessels of obscure origin.

**RETINAL PERIPHLEBITIS.**—**Okabe**—Not available.

**RETINO-CHOROIDITIS.**—**Lewis** reports a case of retino-choroiditis in a woman of 51 years.

**Haab's** observations were previously noticed (Y. B., v. 13, p. 200).

**GUNN'S DOTS.**—The changes in the retina known as **Gunn's** or **Crick Dots** appearing as minute yellowish shiny dots, mostly on the nasal side of the disc, lying in front of the retinal vessels and best seen near the image of the ophthalmoscopic flame on the retina, have apparently been misunderstood, judging from most descriptions of them in important textbooks, according to the Editor of the *British Journal of Ophthalmology*. **Paton** explains it by the fact that they must be viewed with a plain mirror and a solid flame. According to his experience they are found in a large number of cases complaining of intolerance of glare, with only insignificant errors of refraction.

**MONGOLIAN IDIOCY.**—**Wood** has found no retino-choroidal and optic nerve changes in Mongolian idiocy.

**SPASTIC PARALYSIS.**—**Kearney** emphasizes the importance of eye-ground examination in infants after difficult delivery. Intraocular hemorrhage at birth is responsible for 70% of spastic paralyses. Blurring of upper and lower margins of the discs or papilledema may result. Early diagnosis and operation give the best results.

**HEMERALOPIA.**—Different affections having been placed together under the name of War Hemeralopia. **Wessely** insists that it is necessary to get uniformity of examination, especially in the method of the examination of adaptation. Such methods must permit a continuous measuring of the source of adaptation, and must permit the simultaneous observation, under the same external conditions, of a person of normal adaptation. For this purpose **Wessely** constructed a simple adaptometer. Of 120 soldiers, not wearing glasses, a little over 80% had normal adaptation, about 15% had one half the normal, and 3% had even a lower adaptation. Errors of refraction make conditions considerably more unfavorable, myopia playing the principal role.

All these cases of "physiologic inferiority" are characterized by the fact that the disturbance of adaptation is least noticeable on transition from strong light-adaptation into dark, and that the difference compared with the normal remains relatively the same in the further course. The liminal values are rarely raised, and a divergence of the curves, typical of true hemeralopia, never occurs. Even the Purkinje phenomenon retains the same relative value compared to the normal. Not only the test for white, but also the use of blue and red lights are often needed as diagnostic aids to distinguish the true hemeralopes from those of only raised liminal value.

Critical examination diminishes the number of cases of true war hemeralopia. Some cases show only slightly diminished adaptation and some even normal adaptation; some of these cases



must be looked upon as neurasthenic autosuggestion. The question is still open whether raised liminal value can be acquired. The number of cases supposedly due to absence of certain substances from the food, and to physical and mental exhaustion, become smaller the more careful the examination.

In Toulouse, **Frenkel** found the cases of hemeralopia the most numerous in myopes. He divides hemeralopes into major and minor hemeralopes, according to the number of meter candles necessary to recognize the marks of the photometer. Minor hemeralopia is more prevalent in lower grades of myopia, and in individuals with hemeralopia that are not myopic. Major hemeralopia is more frequent in high grades of myopia and in certain ocular affections even aside from the pigmentary degeneration of the retina. The photometer of Foerster can be used to detect stimulated hemeralopia, because repeated examinations will give figures that show variations within certain limits only in individuals acting in good faith.

In a very readable paper explaining the several conditions influencing seeing at night, **Landolt** separates those who suffer from night blindness since before the war from those who have the disease as a result of the war. Among this latter is a group of cases of, as he calls it, nocturnal amblyopia or false hemeralopia, found in individuals with uncorrected ametropia and those having corneal lesions. The other group, the true hemeralopes, comprises cases with chorio-retinal lesions, retinitis pigmentosa, choroiditis, congenital affection of the neuro-retinal system and congenital night blindness. In the first group the infirmity may be corrected by glasses and the men kept at the front. In the second group, the individuals may be put into auxiliary military service; most of them may be kept at the front, but care must be taken to notify the commander of their condition. Cases rendered night-blind as a result of the war are very rare and the condition should be easily cured by rest, diet, eggs, cod liver oil and iodid of potassium, etc.

**Braunschweig** has written on examination of light sense and **Mosso** on hemeralopia.

Of one hundred and forty cases of hemeralopia examined by **Birch-Hirschfeld**, one hundred and eight had suffered from this condition before the war, but the condition had been aggravated during service. In thirty-two of the cases the condition had become noticeable during service; in nine cases there was loss of blood; in five gastrointestinal disturbance had formed a certain causal factor. These cases offered a good prognosis. Sixty cases were in myopes, of which twenty-six were of more than six diopters. The field for blue was especially restricted in these latter cases.

For the distinction of the real from the simulated night-blind, **Feilchenfeld** places the patient in a dark chamber for one hour and then tests the pupillary reaction to weak light stimuli. With the true night-blind the reaction is almost as sluggish as before the dark room period, but the reaction of the pupil is more lively than before in the normal individual.

Exact measurement of the threshold stimuli, according to **Crzelltizer** is necessary for the exact study of hemeralopia. As a unit he recommends the "mikrolux," the millionth part of the normal candle. His adaptometer permits plotting of the whole adaptation curve, but it is sufficient for the diagnosis to have threshold value after a thirty minute dark adaptation. This ought to be with the normal 15 to 20 mikrolux. He who has more than 80 to 100 mikrolux is actually night blind and is unfit for field duty.

Owing to the difficulty in getting reliable examination of the dark adaptation in cases of hemeralopia in the field, **Jess** recommends careful taking of the field of vision, especially with colors; since field disturbances are a constant symptom in hemeralopia. In order to recognize the beginning contraction of the blue-yellow, in comparison with red-green limits, it is necessary to watch carefully the limit of yellow. This will, with the ordinary colors employed, show a contraction, as

first pointed out by Krienes, when one cannot yet be discovered with any blue. Of 61 "night-blind" soldiers of all arms, 35 showed field disturbance verifying the diagnosis of hemeralopia. Of the other 26, 6 were so-called dioptric hemeralopias, 18 without any disturbance of adaptation when examined with a photometer, and only 2 showed no field anomalies in spite of distinct disturbance of adaptation. Exact histories and long observation proved the hemeralopias to be congenital or acquired before the war. Only 8 times did the hemeralopia originate during the war, and then it was possibly due to disturbance of nutrition or exhaustion.

In examining with the light dial, **Loehlein** recommends that the results be compared with the results of the examination of individuals known to have normal adaptation, and that glasses are to be placed on the normal individual to reduce his vision to that of the patient examined. Of the so-called night-blind not all are really hemeralopic. In many the complaints are due to nerve exhaustion, arteriosclerosis, alcohol, tobacco and other causes. In some cases of real hemeralopia the patient was not actually aware of the defect, and discovered the trouble early in the war. Real hemeralopia rarely develops at the front, and then an ocular or general disease was present. It is necessary to determine the cause of the disturbance in each individual case. In the rare cases of acquired hemeralopia the removal of the primary disease is necessary. Patients affected with a high degree of this condition can be used in only very special occupations relating to the war; moderate cases when used at the front, should not be put on night duty, driving, etc.

According to **Junius** hemeralopia with fundus changes is rare; it is nearly always an old condition becoming manifest under war conditions. Reliable observers admit of it originating during the war, but it is very rare. Errors of refraction, especially high myopia, play an important part. No man should be discharged from the army when he can still render some service even if he

presents a diminution of the light sense. On the other hand one ought not to hesitate to discharge a man with sufficient visual acuity during the day if he is unable, according to the report of his superior, to discharge all duties at night. One can hardly expect improvement or cure of the hemeralopia by treatment or exercise. In doubtful cases treatment ought to be tried. The method of examining the field is still to be improved; the Birch-Hirschfeld adaptometer is desirable. Compensation by the state is to be given only to him who has actually acquired undoubted invalidism in consequence of the war.

While disturbance of vision at night is fairly frequent at the front, **Aubaret** finds the number of cases of true hemeralopia relatively small, and that hemeralopia appears in several forms according to the site of insufficient adaptation: pupillary (fairly frequent), retinal or cerebral. Insufficient pupillary adaptation is amenable to treatment. Dark glasses worn during the daytime are of service in retinal and cerebral faulty adaptation. Improvement of general physical condition, rest and tonics are necessary.

**Gelencser** found that the disturbances following limited diet and the constant absence of certain food products (vitamins) could be improved and cured in several cases when he, on the suggestion of Arnstein, added to the mixed diet doses of calcium lactat 0.5 gr. three to five times daily. One must not forget that the war hemeralopia is mostly found in worn out and nerve exhausted individuals. **Elschnig** thinks a large part of those suffering with hemeralopia are neurasthenics and convey the psychic infection to a whole battalion; and at times they are malingerers. Repeated examinations of the threshold of stimuli, after different adaptations, should the figures not tally, will detect malingering.

**El-Rasheed** reviewing 52 cases seen in Egypt classifies night blindness as follows: Retinitis pigmentosa with and without pigment changes; congenital hemeralopia; myopia, liver disease, diarrhea, malnutrition combined with



the effect of glare and other causes. This latter group also contains the cases of periodic hemeralopia. He gives examples of different groups and the differential diagnosis. Affections of the liver cause night blindness without noticeable signs in the fundus. Keeping bowels open and regulation of the diet, with the addition of roasted liver to the meals, is employed in mild cases. In more serious ones the prognosis depends on the underlying condition. In early cases due to malnutrition cod liver oil, liver feeding and the use of black glasses will result in speedy cures. One of his patients showed periodic attacks of night blindness coming on in summer during the Nile flood. The duration of the night blindness in that particular case was diminished in each succeeding attack. Nothing abnormal was found in the abdomen. Night blindness is a condition requiring careful investigation in order to arrive at a concise analysis of the cause and thereby to an appropriate means of cure.

**Dehogues** reports ten cases of hemeralopia in charcoal burners in Cuba. Examination of the blood was made in order to establish whether inhalation of carbon monoxide was the cause of the condition. In every instance noticeable reduction in the hemoglobin was present, together with other characteristics produced by the carbon monoxide poison. After treatment with tonics for two weeks, the blood showed a return to the normal while the hemeralopia had entirely disappeared.

**DETACHMENT OF THE RETINA.**—The Committee of the Ophthalmological Society of the United Kingdom (Proc. v. 36, p. 352) reports a review of 85 collected cases of cures of detachment. Of these 44 cures occurred after operation. Operation has been successful in myopia, traumatism, cataract extraction and idiopathic, even after two years duration. The youngest individual was 15 years, the oldest 78 years. It occurs in spite of vitreous opacities. In none of the cases was retinal rupture or hole present. Scleral puncture with knife or cautery was most beneficial. Intra-

vitreous injections are of no benefit as to visual acuity; perfect function may result but reattachment with poor function may occur. Spontaneous cure occurs in myopia, traumatism, pregnancy, idiopathic cases even after detachment of over two years' standing. Spontaneous cures have occurred in spite of the tears of the retina. (c) Non-operative treatment is most efficacious. Especially rest in bed and the pressure bandage. In albuminuric cases recovery occurs after rest in bed alone.

Treatment by electrolysis for retinal separation is proposed by **Verhoeff**. The retina is first replaced by means of scleral puncture, and the patient kept in bed for one week. Under cocain anesthesia a large number of minute punctures through the sclera and retina are now made. Small half-curved needles are used for each puncture, and the current from six dry batteries of  $1\frac{1}{2}$  volts each is employed for about five seconds. The positive electrode is applied to the cheek. The punctures are made directly through the conjunctiva, the needle protruding into the vitreous only one or two millimeters. The patient is kept in bed for about ten days. A case is reported of a woman of 43 years with separation of six years' standing in which complete reattachment occurred with partial recovery of function.

In five cases of trephining for detachment in four patients, **Green** had four failures and one success; but a success that may at any time be converted into a failure, the operation on the other eye of the same patient having proved a failure. The four failures were all in old detachments. The one successful case was operated on within three days after occurrence of the detachment. It is, therefore, more rational to operate soon after the onset of the detachment than to temporize with nonsurgical methods.

**Curtin's** patient, (Y B. v. 12, p. 204, and v. 13, p. 218), has still normal vision and field and the retina is still in place three years after the operation. Curtin reports another case in a man of 62 years with flat detachment in the entire lower half. Three weeks after

trephining and aspirating of a yellow fluid, the retina was in place, with vision 20/100. Detachment of the retina in **Chance's** patient, a boy of 5 years, was in the lower half and quite translucent. There was no evidence of inflammation, but a whip of vessels extended in the cornea from the upper limbus. The previously normal tension was increased of late.

With **Blaskovics**, **Toereck** classifies detachments into two main groups: Disproportion between the contents of the eyeball and its coats, and the other where the disproportion does not exist. To the first group belong shrinking of the vitreous from various causes; and those cases where extension of the sclera is the cause, as in myopia. To the second group belong the detachments after exudates of all forms. The prognosis and treatment depend wholly on the cause; only in cases belonging to the second group can cure be expected. Two cases illustrate the points. A woman of 49 years had a detachment, due to arteriosclerosis, which spontaneously disappeared for a while, to reappear later and also to appear in the other eye. In the other case, a man of 30 years, lost his right eye from detachment years ago. The left eye showed old and recent choroidal patches, which reacted positively to tuberculin, and also some small areas of detachment. Under tuberculin treatment the choroidal patches became absorbed and the retina reattached.

In the first group the prognosis is less favorable. **Mueller's** operation tries to relieve the disproportion by excising a piece of the sclera and, as modified by **Blaskovics**, is as follows: After extensive canthotomy under anesthesia, the conjunctiva is dissected up and the external rectus severed between two sutures. In the sclera thus exposed an oval space about 20x10 mm. is outlined with a scalpel. The incision extends through half the thickness of the sclera and the superficial layers are removed. Five double-armed sutures are now inserted; and the posterior part of the incision carried through the whole thickness of the

sclera, the choroid to be avoided. The choroid is separated from the sclera, then punctured. The sutures are drawn together and the scleral flap is pushed into the pocket between sclera and choroid. The sutures in the externus are tied and the conjunctival wound closed. Both eyes are bandaged and the patient remains in bed eight days. **Toereck** has operated eleven times and had no permanent results in his first six cases. In the latter five cases he increased the size of the scleral flap and the results are more promising. Short histories of these cases are given.

**Schiötz** reports the results after the preequatorial sclerectomy of **Holth** in 21 cases of detachment. On discharge 5 were improved, 9 unchanged and 6 worse. After nine months to 2½ years, 3 were improved, 5 unchanged and 11 worse. **Grönholm** has written on pre-equatorial sclerectomy in detachment of retina. According to **Holth** spontaneous cure of detachment is so rare that it need not be considered in the estimation of the results of operation.

**Peyrecave** succeeded in curing five cases of myopic detachment by rest in bed; and subconjunctival injections, twice weekly, of gelatin in 20% saline solution. The detachment in **Blake's** patient began two years before, following an injury. After trephining gradual improvement continued during ten months. Vision ultimately rose to 20/200, with normal field. **Hughes'** patient with detachment of the retina was struck by piece of iron two weeks before. The detachment was elevated about 7 D. and in the discussion the diagnosis of sarcoma of the choroid was suggested. In **Garraghan's** case of detachment, in the shape of a plaited funnel, the blindness of the right eye was discovered two months before. There had been no injury, no pain.

Detachment at the ora serrata is reported by **Lawson** in a man near whom a bomb burst five months before. The pupil was wide, vitreous hazy and a diagnosis of severe contusion was made. Vision improved to 6/9. Later sudden diminution of vision occurred, the pupil was small with veil-like de-



tachment close to the lens. Foreign body in the globe was now suspected, owing to the irritation of the eye and changes in the pupil. This was verified by a skiagraph. Later the retina greatly reattached, and a shiny foreign body could be seen. Gradually the eye became irritable, and enucleation was performed. The pathologic examination by **Collins** showed the retina at the ora serrata torn away from the ciliary body. The foreign body must have entered the upper and outer part of the

globe, passed through behind the lens to the ciliary region on the opposite side; and contraction of the vitreous was the cause of dragging towards the center of the globe, of the retina in the region of the ora serrata.

The right eye of **Wootton's** patient presented a flat, wavy membrane resembling a retina that had been torn from the ora serrata, extending from above downward, on the temporal side. The mass was possibly one of proliferating retinitis.

## TOXIC AMBLYOPIAS.

DELAMERE F. HARBRIDGE, M. D.

PHOENIX, ARIZONA.

This section includes the literature from January, 1917, to May, 1918. But some instances of the harmful action of certain substances may be found under "Therapeutics," or under "Injuries." See also "Optic Nerve."

**QUININ AMBLYOPIA.**—**Ballantyne** presents a very complete analysis of the various theories and experiments, which have been offered in explanation of the production of quinin amaurosis. A good reference list follows. The author first details a typical case, followed by the case history of one of his patients, pointing out wherein it differed; in that, altho the patient was first seen four days after the administration of the quinin, blindness ensuing, a further period of five days elapsed before the characteristic ischemia of the disc and retinal vessels made its appearance. The paper is summarized as follows:

1. That in quinin poisoning, complete loss of vision may be found, in association with a normal condition of the fundus oculi; and that there may be a striking recovery of vision, in spite of the presence of well marked fundus changes.

2. That in all, or nearly all, cases of quinin amaurosis, ophthalmoscopic changes, such as congestion of optic nerve and retina, pallor of the disc, narrowness of the retinal vessels, and cloudy opacity of the retina, make their

appearance sooner or later; but that there is no correspondence between the character or severity of these changes, and the intensity of the visual defect.

3. That the visual defect cannot, therefore, be due to such changes, but rather to a condition of the retinal elements invisible with the ophthalmoscope.

4. That this change may be induced, or aggravated, in the first place, by ischemia due to contraction of the vessels of the optic nerve and retina; but that it is, in the main, the result of a direct toxic action of quinin upon the retina itself, and that the ultimate recovery of central vision, with loss of peripheral vision, and failure of vision in twilight, suggests a selective action of the poison upon the rods.

**Santos Fernandez** directs attention to the disturbance of vision from quinin and paludism, as possibly being a hybrid affection. He notes, especially, cases of sudden blindness, following the exhibition of quinin for several malarial attacks. The anatomic basis is apparently total ischemia of the papilla, followed by atrophy of the optic

nerve. In such cases, the drug is naturally accused, but it is, of course, not impossible that the disease was an active factor. Does quinin ever set up this ischemia in the subject, and does its action on the plasmodium react unfavorably on the organism? It is highly important to ascertain the special affections of the eye, which result from paludism alone, and from quinin alone.

Quinin, without reference to any particular therapeutic use, is commonly accused of causing "amblyopia" and "amaurosis," which names suggest functional disturbances of temporary duration. It is conceded, however, that it is not so much heavy dosage, as idiosyncrasy, which is responsible for quinin amblyopia, etc. The entire question remains unsettled, because of lack of autopsy material, and because we are influenced, necessarily, by results of experimental work on animals; which appear to show that quinin is surely neotropic to the optic nerve, if the dose is large enough.

A soldier, aged 20 years, received by mistake, 40 grams of sulphat of quinin, instead of sulphat of magnesia. In half an hour, he lost consciousness. When he recovered, he could neither hear nor see. Examination by **Galiana** showed pale papillae, muddy edges, contracted vessels, fingers at 2 M. About three weeks later, when last seen, vision had greatly improved, but fields remained contracted. This is the only case of amblyopia by intoxication, observed by Dr. Marquez, in the Buen Suceso Hospital, among 34,000 patients seen in fourteen years.

**ETHYLHYDROCUPREIN AMBLYOPIA.**—A lady, aged 40 years, to whom 4 grams of ethylhydrocuprein in 0.20 gram doses, every two hours, was administered for pneumonia, developed tinnitus, later complete deafness, and just before the last dose, total amaurosis. **Lorant** observed the pupils moderately dilated and fixed, papillae pale, contracted vessels, arterial pulse on pressure on globe, and in the left eye, small, circumscribed hemorrhages.

**Schreiber** reports three cases of visual disturbance, due to internal use of

ethylhydrocuprein. A doctor, aged 54 years, ill with pneumonia, received four 0.3 gram doses of quinin hydrochlorid, fourteen 0.25 gram doses of ethylhydrocuprein and one tablet of digipuratum, three times daily. On the fifth or sixth day, amaurosis developed, which disappeared in ten hours. Two months later night blindness developed. There was no optic atrophy, altho the blood vessels were narrowed. The second patient was a woman, aged 57 years, who had received 1.75 grams of ethylhydrocuprein. Optic atrophy, narrow vessels, good visual acuity, but narrow fields ensued. The third patient, a woman, ill with pneumonia, showed conditions as found in the second patient.

**Schiötz** reviews, in detail, ethylhydrocuprein and its drawbacks. He also reports a case of transient blindness, in a sailor, aged 48 years. While the vision is reduced, it was not enough so to incapacitate him. He was color blind, and had restricted fields. **Van der Hoeve** and **Mansholt** report of a patient with pneumonia, on an exclusive milk diet, who was given, in moderate doses, a total of 4 grams of optochin. He became totally blind. Vision partially returned, but with paralysis of accommodation, atrophy of the optic disc, and sclerotic changes in the vessels. The vascular changes did not develop until several weeks after the first symptoms, but they continued a progressive course, while the nerve changes seemed to show a tendency to retrogress.

Out of thirty cases of pneumonia, in which ethylhydrocuprein had been given, **Pollnow** saw no after effects in 25 cases, but disturbances of sight and hearing in 5 cases. In 2 cases, there were slight, quickly transient, visual disturbances; in one, tinnitus of the ears, and two, serious troubles in the eye. Both of the last were quite blind at first. One patient later regained approximately normal conditions, but only a very slight improvement was obtained in the other. They received 0.25 grams of ethylhydrocuprein every four hours.



In the latter case, amaurosis set in on the third day, and gradually began to improve after several days. Now, both papillae are very pale, the vessels tortuous, the arteries very small, some obliterated, some with white sheathes. The retinas were edematous over a large area about the papilla, with a red spot in the fovea. Vision of each eye, fingers at from 1 to  $1\frac{1}{2}$  meters. Visual fields were concentrically contracted to a high degree. Blue and red are the only colors recognized of large objects. Diagnosis, neuritic atrophy, secondary to disease of the optic nerve, and retina, with edema and vascular disease.

In the other case, the symptoms and the changes in the fundus are similar, but the vision has improved to 4/4. It appeared to the writer to be a typical quinin poisoning, in which probably, circulatory disturbances play the chief part. On account of the greatly varying susceptibility to quinin, ethylhydrocuprein should be given in very careful doses.

**Feilchenfeld** observed a man, aged 20 years, who was given 5 grams of ethylhydrocuprein in the course of thirty hours, for a beginning pneumonia. After one day, there was loss of hearing, and a day later, poor vision, which within another twenty-four hours had become almost complete blindness. Both symptoms receded, under the employment of large doses of sodium iodid, and tincture of strophanthus, but at the end of two months, there was a permanent injury, manifested by hemeralopia, flickering before the eyes, annoying subjective scotoma, concentric narrowing of the visual field, and of color sensation in both eyes. The employment of ethylhydrocuprein, internally, should, therefore, begin with smaller doses; and since the disturbances of hearing always appear first, their occurrence should always be the signal for immediate cessation of the drug.

**NITROPHENOL AMBLYOPIA.**—Three observations are published by **Sollier** and **Jousset** of soldiers, employed in the use of nitrophenol in the manufacture of high explosives. All suffered

from symptoms closely allied to those of a chronic retrobulbar neuritis. The first had early paralysis of the brachial plexus with a slow atrophy of the deltoid. The ophthalmic examination gave a visual acuity of 5/10, accommodation paralysis, green blindness and a concentrically contracted field. There was slight edema of the nerve head.

The second case had anesthesia and paralysis in both feet. Acuity of 2/10, with central scotomata for green and yellow, and contracted field and accommodation paralysis, with normal pupils. The third had a bilateral papillitis, with acuity of 1/20, in the right eye, and 3/10, in the left.

The authors have fifteen analogous cases, but cannot trace the point of entrance of the poison. Perhaps the nitrites, being vasodilators, might be counteracted by the use of a vasoconstrictor. It is well to warn the workers, so that they may be on their guard, and have them use masks, gloves, and hand disinfection. At the first symptoms, the worker should be sent to a specialist, who will decide upon the advisability of giving up the position in the powder industry.

**PAINT AMBLYOPIA.**—**Besenbauch** alludes to the frequency of untoward effects of the volatile principles in paints, as experienced by painters. He relates a case in which the nature of the fumes was obscure. The patient suffered an acute hallucinatory confusion and optic neuritis. Benzol could be excluded, but the manufacturers admitted the use of a distillate of Borneo petroleum known as sanzazol. This statement was confirmed by an analysis. The toxic substance was also identified as putrol, a substitute for turpentine, known for its disagreeable odor. The paint, a light green, was used on ships, especially for decorating small spaces, in which ventilation was poor. Numerous cases of poisoning had been reported, and a single case is given in detail. The victim made an uneventful recovery. To prevent such accidents, painters are warned not to converse, whistle, etc., while painting. The greatest possible ventilation should be secured, a portable ventilator being

available. The shift should be only three hours long, with an hour's intermission, to be spent on deck. The paint, pronounced relatively nontoxic, was not condemned.

**WOOD ALCOHOL AMBLYOPIA.**—There was no demonstrable ophthalmoscopic cause in **Risley's** patient, who doubtless suffered with a sudden blindness, due to wood alcohol. A young Italian, with his friends, was in the habit of using a beverage made of alcohol, water, sugar, and "orsa rossa." The nature of the latter was not ascertained. **Golovin** has written, regarding blindness after the use of wood alcohol, and the other substitutes for vodka.

A male, aged 33 years, presented by **Strickler**, may have suffered a toxic amblyopia, due to tobacco or alcohol, although the history and findings were not conclusive. Vision was reduced to counting fingers at three feet, color sense fair for green, red or blue. There was no true scotoma. The temporal side of the disc was pale, the nasal side appeared swollen.

**LEAD AMBLYOPIA.**—Five or six months previous to consulting **Leoz**, a mining engineer noticed weakness in his sight, which increased until he had to give up his work. On clear, sunny days he was unable to see where he was going. Distant vision was rather better than near, a dark spot and a halo somewhat less dark, obscuring close objects. Luetic, alcoholic and tobacco history was negative. The paralysis of the extensors of the fingers confirmed the diagnosis of saturnin amblyopia. The fundi were slightly congested, and the papillae of a reddish color. Definite scotomata were observed. Following the use of iodides, laxatives, and sulphur baths, a cure was effected within two years. For practical reasons the author advises scientifically studying the special causes of toxic amblyopias. If lead intoxication provokes a nephritis, and this in turn a retinitis, the amblyopia would be albuminuric and nothing more.

## THE OPTIC NERVE.

CHARLES P. SMALL, M. D.

CHICAGO.

This review covers the literature relating to the optic nerve from January, 1917, to May, 1918.

**ANATOMY AND HISTOLOGY.**—Impressed by the variety to be observed in the amount of *cupping* in cases of glaucoma, **Fuchs** has written an exhaustive paper accompanied with forty-eight drawings and microphotographs, to show that the difference might be largely due to variation in the anatomy of the lamina cribrosa. He says that the picture of excavation is first formed by the weakening and subsequent disappearance of the glial trabeculae. The connective tissue trabeculae follow later. If this occurs early, cupping is deep, while there is still good sight and but little alteration in

the nerve head. If, however, it occurs late, then, while the cupping remains shallow, and is mainly due to atrophy of the nerve, the sight rapidly diminishes. He concludes that the usual process in raised pressure consists in a sclerosis and thickening of the lamina, probably as a result of the greater load it has to bear. This may either remain as a permanent change, or resorption may follow under the continued pressure.

That *hemorrhage* into the optic nerve sheath, vitreous, and retina not infrequently follows fracture of the skull is evident from the review of the litera-



ture. How frequently this condition occurs in cases of spontaneous intrameningeal hemorrhage is uncertain. One such case is recorded by **Doubler** and **Marlow** in a negress about 32 years old. She was suddenly seized, while at work, with vomiting, and fainted. The vomiting soon ceased, but her blood pressure swiftly rose until it was 300 and could not be recorded, and she died in about six hours after the attack.

In the autopsy the interesting findings in this connection showed chocolate brown masses of clot completely overlying the papilla, extending in an irregular manner into the vitreous. The macular area was clear; the peripheral retina contained a few small hemorrhages. The hemorrhage on the papilla appeared to be a direct extension from within the nerve sheath. It is of interest to note that intracranial pressure great enough to force blood into the sheaths of the optic nerves, and apparently through the lamina cribrosa, should not produce a papillitis and choked disc.

**ANOMALIES.**—**Zentmayer** presented a case of congenital anomaly of the optic nerve and choroid in a woman 35 years of age, whose vision had always been defective. (See p. 60.) In the right eye there were two large wing-shaped areas of defective choroid which spread out from the optic nerve to the temporal and nasal parts of the fundus. The defect in the choroid was complete. The papilla was oval and presented at the scleral ring on the temporal side a porus opticus thru which the retinal vessels emerged. The eye was myopic 8 D. In the left eye, which was myopic 3 D., the choroidal defect was much less extensive and not complete, the choroidal vessels being present and showing sclerosis in places. The right eye was divergent; but this had been almost corrected by an O'Connor advancement of the internal rectus.

**Menacho** exhibited an interesting case of *opaque optic nerve fibers*. Beginning at the disc, they covered a rhomboid area about twenty-two times as large as the disc, and extending slightly to the nasal side of the disc

above and below, about three-fourths of the expanse being above the level of the disc. From a point about midway between the temporal edge of the disc and the macula, in the expanse of fibers running horizontally, there was a dehiscence to the temporal edge of the opaque area, and measuring vertically about a half disc diameter. The macula had undergone extensive destruction, showing areas of white sclera and localized deposits of pigment.

**Buchanan** reports a case of congenital anomaly of optic nerve fibers, which is very unusual. The course of the fibers was between the retina and the hexagon pigment layer; not, as is usual, in the anterior layer of the retina. The eye had been excised because of an injury. A very small, nearly white band of fibers was seen in the optic nerve at its temporal side. It was at once noted, however, that the band of medullated fibers passed sharply round the edge of the choroid and lay between the retina proper and the hexagon pigment layer. The nerve itself seemed to have a notably oblique position in the sclera, and the abnormal band of fibers took a peculiar double curve round the edge of the choroid. As the lamina of Bruch was present in all sections up to the edge of the nerve head, it is to be supposed that there was no coloboma of the choroid or optic nerve.

**Collins** presented a man, 57 years of age, on whose left optic disc, and nearly confined to its area, are several small, and remarkably *tortuous* veins. Those on the temporal side extend for a short distance beyond its margin into the retina. In the skin of the patient's left lower lid are two small, widely separated, *vascular nevi*. In the skin of the left temporal region there is a large, mottled, capillary nevus. The patient has, since a boy, been liable to bleeding from the nose when he blows it, and the blood comes mostly from the left nostril. On examination of the nose, a small patch of dilated veins is seen on the left side of the septum. The interest in this case is the association of these abnormal retinal ves-

sels with an abnormal condition of the vessels of the eyelid and nasal septum. Other cases of this condition have been recorded.

**Velter** reports a rare case of *coloboma* of the papilla in a man 28 years of age. The right eye was normal in every way. In the left eye, vision was 1/40, the eyeball was microphthalmic. The ophthalmoscope showed a complete coloboma of the optic nerve head, all other portions of the fundus normal. The visual field was much contracted, especially the upper field, and there was considerable enlargement of the blind spot.

**Shumway** reported a case showing an unusual development of *hyaline bodies* on the optic nerve head. The young man's vision had been poor since childhood. The margins of each optic nerve were covered by extensive clusters of the hyaline bodies, which were peculiarly waxlike and glistening in appearance. The macular region in each eye was the seat of widespread superficial disturbance of the choroid and retina, so that vision was reduced to 20/30. There was *achromatopsia* for green.

**RETROBULBAR NEURITIS.**—In making a diagnosis of retrobulbar optic neuritis, which is an inflammation of the maculopapillar bundle of the optic nerve, **Nagle** points out that we are dealing with a condition which may be a symptom per se (alcohol-tobacco), or it is merely one factor of a symptom complex. The author quotes **Uhthoff's** statement that he was unable to name the cause of retrobulbar neuritis in fifty per cent of his cases at its incipency. The chief cause of retrobulbar neuritis in Germany would probably be considered to be multiple sclerosis. In our country, however, alcohol and tobacco are the most frequent causes. Some differential diagnostic points between retrobulbar neuritis and multiple sclerosis are mentioned, to show that in a large proportion of cases of multiple sclerosis, this condition occurs as an initial symptom.

**Lenoir**, in his thesis on acute infectious retrobulbar optic neuritis, describes the characteristic symptoms of

this affection. These are: rapid and often complete diminution of vision, accompanied by periorbital pain, increased by pressure on the globe; ophthalmoscopic appearance usually negative; the intensity of the pain being not necessarily in proportion to the gravity of the trouble. He describes the pathology, and states that the prognosis is generally favorable, there being recovery in a short time, with no marked visual defect.

**Roenne's** case of retrobulbar neuritis with *wandering defect in the visual field* began with a loss of the nasal lower quadrant, which was replaced by a relative paracentral scotoma to the nasal side of the center. This defect gradually moved into the upper nasal quadrant of the visual field, where it grew less marked and finally ended with a distinct, though not strongly accentuated, hemianopic boundary line in the upper nasal quadrant, before it passed over to complete recovery.

**Dor** believes that retrobulbar optic neuritis, in a large majority of cases, is due to a *periostitis* about the root of one of the two upper bicuspid *teeth* on the affected side. The periostitis is often accompanied by a dental fistula, or dental alveolar cyst. This condition is also responsible for numerous other eye affections, as venous thromboses with retinal hemorrhages, embolism of the central retinal artery, choroiditis, iritis. **Jocqs** reports a case of retrobulbar optic neuritis following a *nasal infection*.

**PAPILLEDEMA.**—**Collins** gives a case history similar to that of brain tumor. The patient suffered with *chronic nephritis*. There was a history of head-trauma. Tumor had to be excluded. The classic signs of tumor were present, headache, vertigo, vomiting and choked disc. Spinal puncture proved the cerebrospinal fluid to be under considerable pressure. It has frequently been remarked that the cerebrospinal fluid comes out under pressure in cases of anemia attended by "optic neuritis." It is quite possible to have a neoplasm develop in a person who has chronic nephritis; and it is possible to have a fundus picture typical of nephritis in a



brain tumor. If papilledema is the result of increased pressure of fluid in the vaginal sheath of the optic nerve, the pressure may in this case be the manifestation of edema, such as occurs in other parts of the body constantly in chronic nephritis.

Papilledema and other affections of the eye have frequently been observed in cases of accessory *sinus suppuration*, more especially when the suppuration has been in the sphenoidal or posterior ethmoidal cells. **Watkyn-Thomas** and **Scott** report such a case, associated with abducens palsy and other ocular lesions. A young soldier was struck below the right eye by a fragment of shell; there was no concussion. When seen two weeks later there was but little swelling of the lid, none of the ocular conjunctiva, no proptosis and no pain. He could count fingers.

The next day intense pain in the right eye set in, much increased by any movement of the head. Chemosis of the ocular conjunctiva soon developed, and intraocular pressure was much raised. Examination of the fundus showed the disc swollen to  $-3$  D. Skiagrams demonstrated a small fragment of the shell well forward, probably in the ethmoid labyrinth. During the process of the operation which was performed on the following day, the fragment fell into the antrum, where it was thought best to allow it to remain until the other parts were more nearly healed. There was a resulting diplopia due to paralysis of the external rectus. The swelling of the disc rapidly lessened and in a month's time the vision was  $6/24$  and the weakness of the external rectus much less. The increased tension was thought to have been caused by the pressure of the edematous orbital tissues on the ophthalmic veins.

**Wallis** reports a case of *papilledema* which did not manifest itself until two months after the injury which caused it. The patient, a young soldier, received no less than thirty wounds from the explosion of a trench mortar bomb. The left ramus of the lower jaw was shattered, and in the attempts to remove sequestra of the mandible there was apparently set up a local *meningitis* from in-

fection through a traumatic fissure of the glenoid fossa. A well developed papilledema was present, the swelling being  $+3$  D. above the rest of the fundus. One year later the visual field was full for a 5 mm. white object, and the visual acuity was  $6/5$ . The fundus appeared normal with little or no atrophy of the nerve. The importance of dealing very cautiously with a wound of this character requires no emphasis, for it is obvious that much disturbance of the parts might give rise to a fatal meningitis.

**Kearney** discusses the value of eye ground observations in recent *fractures of the skull*. Based on the examination of 212 cases that were diagnosed as fractures of the skull, he concludes that a rise in the intracranial pressure above normal is usually one of the most damaging factors. When examined within 24 hours after the injury there is usually found a general edema blurring equally all the details of the fundus, which if uncomplicated, gradually subsides. Occasionally there will be a gradual increase of the edema, which means an increase of intraocular pressure. In some instances the edema of the disc amounts to a true papilledema and in these cases a lumbar puncture has relieved the condition. When the pressure is still greater, cranial decompression is advised.

The rather unusual occurrence of a complete *bilateral ophthalmoplegia* with choked discs, is reported by **Blake**. The patient was an eight year old Russian girl. The first symptom complained of was a severe headache and when her eyes were first examined, one week later, the patient was lying apathetically with eyes closed. The lids could be opened with considerable effort and the eyes were fixed in a straightforward stare. There was only the faintest mobility in any direction. The pupils were widely dilated and reacted only in the least degree to light. Fundus examination revealed an intense swelling of both nerve heads with no hemorrhages or exudates into the retina. There was no light perception. The general physical examination, including exploration of the nasal si-

nuses, was entirely negative. The patient was kept in bed, cathartics given, and ten drops of saturated solution of potassium iodid given three times a day. Improvement in her condition began immediately and in a few weeks the eyes appeared practically normal with 20/20 vision in both eyes.

A double papilledema occurring several months after a head injury from falling down stairs, is reported by **MacKenzie**. From the signs and symptoms a diagnosis was made of a tumor located in the region of the right inferior frontal convolution. In the right eye the swelling of the disc was 6 or 7 D, and only slightly less in the left. The patient was operated on, the dura opened and a considerable quantity of almost black fluid and dark clots were removed. The symptoms all subsided rapidly and in a few weeks there was no evidence of swelling of the disc, distension of the veins, or hemorrhage.

**Weyers** reports the case of a papillitis due to a large abscess of the frontal lobe, following an acute *otitis media*. There was paralysis of the facial nerve on the affected side, and spasm of the same nerve on the other side.

**McCaw** presented a young woman with poor vision, diplopia, swollen discs, tortuous retinal vessels, inability to read, metamorphopsia and exudate at macula. The fundus of the left eye had the appearance of albuminuric retinitis. There was a positive Wassermann reaction. The patient was given anti-luetic treatment. Two cases of optic neuritis following tumors of the hypophysis have been reported by **Shikano**. In both of these there were apparently *syphilitic gummata* in the region of the sella turcica. The skiagrams showed that both have been destroyed by the pressure.

**OPERATIONS FOR PAPILLEDEMA.**—In a boy eighteen years of age, whose vision had failed rapidly during the preceding year **Osborne** found typical *choked discs* in both eyes. Vision in the right eye was 5/30, left, counting

fingers at 3/4 m. Examination by many internists revealed no cause for the condition. After several days of treatment with no beneficial result, *lumbar puncture* was resorted to. The force of the pressure of the spinal fluid was unusually great. Vision began to improve immediately and eventually became normal.

In the course of an extensive study of the eye grounds in cerebral *spastic paralysis* with changes attributed to abnormal increase in the pressure of the cerebro-spinal fluid, **Kearney** examined the fundi of an infant two weeks old, after a difficult instrumental delivery, who had convulsions about every hour. He found a recent transparent papilledema with elevation of 2 D. confined to the nasal side of the disc. A *decompression* operation was performed and a subdural hemorrhagic clot removed; two days later no elevation of the disc was found. By the time the greater number of children who are suffering from cerebral spastic paralysis, reach the neurologic surgeon, the eye grounds show only regressive edematous changes. Even at this late date the writer has obtained gratifying results by a decompression operation, in selected cases.

Papillidema, in its early stages, gives rise to no disturbance of function. After a time, diminution of visual acuity begins, and increases rapidly to total blindness. The best chance of relieving the condition is by lowering the intracranial tension before the visual acuity has begun to fall. The best result has been obtained by trephining, but recently lumbar puncture has been used as a preliminary substitute for trephining, since it is much less dangerous, and can be followed, if inefficient by the larger operation. In certain forms, especially in cases of hydrocephalus, *puncture of the corpus callosum* would seem to be as efficacious as trephining, and in these cases **Dutoit** is inclined to recommend it before the vision has begun to fail.

(Continued next month)



# DIGEST OF THE LITERATURE.

## THE OPTIC NERVE.

CHARLES P. SMALL, M. D.

CHICAGO.

(Continued from July issue)

**Spiller and de Schweinitz** have observed three cases in which removal of a few cubic centimeters of cerebrospinal fluid has had a remarkable effect on swelling of the optic nerves. In the first patient, a decrease of one diopter was noticed after each lumbar puncture. Two of these cases from a preliminary examination strongly suggested brain tumor, but after a more careful study the diagnosis of encephalitis was made in one case, and of pseudotumor from intoxication or infection in the other.

An operation to cure choked disc is suggested by **Müller**. He resects the temporal wall of the orbit, pushes the eyeball forward, and thus obtains access to the optic nerve. He then *resects a piece of the sheath* 3 or 4 by 6 mm. This relieved the pressure on the nerve in the cases in which he has applied this method, and not only arrested the further progress of the visual disturbances but caused their partial retrogression, and at the same time improved the cerebral symptoms from pressure on the brain.

**PAPILLEDEMA RECOVERY.**—**Krauss** reports a case of choked disc, in a young man of 23, who had been operated on two months previously for goiter. The discs became swollen to +4 D. and +5 D. While central vision was not much impaired he had almost continual attacks of dizziness and intermittent attacks of blindness. The swelling of the discs increased for six weeks, then gradually subsided. The neuroretinitis was followed by a low grade of optic atrophy with a moderate degree of contraction of the form fields. Treatment consisted mainly of five grains of calcium lactat three times

a day. In about nine months there was a full visual acuity.

**OPTIC NEURITIS FOLLOWING ACUTE INFECTION.**—In a patient suffering from *ethmoiditis*, **Bruder** found a resulting retrobulbar neuritis. There was sudden obscuration of vision in the right eye following a cold, and a purulent discharge from the right nostril, associated with headache and a dull pain over the right orbit. Vision was reduced to hand movements. Three days after removing nasal polypi and curetting the posterior ethmoidal cells, the patient's vision was restored to 20/40.

**Wyler** calls attention to the difficulties in the diagnosis of monocular optic neuritis. The *diagnosis* of the eye condition is simple, but the cause is often difficult to find. He supposes the cause to be a local one in the majority of cases, rather than a constitutional or focal one; altho in the latter class the transmission of toxins or bacteria from diseased tonsils, from peridental infections and from latent gonorrhea, have all been responsible for this condition. In order to avoid overlooking any possible feature, he follows a routine examination: roentgenograms of sinuses and teeth, a perimetric test with the campimeter to trace any enlargement of the blind spot (an early feature of sinus optic neuritis). If these are negative a Wassermann test, together with a Hecht-Weinberg test and a urinalysis are made. This is followed by a complete physical and neurologic examination. In case these proceedings are negative the tonsils, sphenoids and ethmoids are explored.

*Tonsillar infections* are the basis for many systemic or local lesions, but op-

tic neuritis from this cause is not a common clinical finding. Such a case was observed by **Suker** in a twenty year old girl. Complete laboratory examinations excluded any other possible cause. After enucleation of the tonsils, which were markedly hypertrophied and full of crypts containing much debris, vision in the affected eye, which was reduced to 20/60, rose in 72 hours to 20/20. The greatly contracted field of vision also became normal and remained so.

A case of monocular optic neuritis following *pneumonia* is reported by **Tenner**. The patient aborted on the day following the onset of the pneumonia. Two weeks later there was a dimness in her left eye. Four weeks later, vision in that eye was reduced to 1/200. There was a large absolute scotoma, and the field of vision was slightly contracted below and nasally. The disc margins were blurred and the veins dilated. Recovery was complete at the end of six weeks.

**Mygind** reports four cases of purulent otitis media with partial affection of the labyrinth, complicated with optic neuritis. In all indefinite signs of intracranial complications (headache, vertigo, vomiting, etc.) were found, but they recovered without operation. **Mygind** thinks with **Koener**, that the cases of diffuse, purulent *otogenous meningitis* with favorable course, are accompanied by optic neuritis.

**Birch-Hirschfeld** obtained good results in three cases of optic neuritis, thru treatment directed to an empyema of the ethmoid. In testing the vision he recommends to add to the methods usually employed, the measurement of the blind spot, which is possible only in very intelligent patients. A transient impairment of vision in the third case he demonstrated to be due to an enlargement of the blind spot. **McKeown** presented a man with disease of the optic nerve and retina, due to accessory sinus disease. His vision was 20/70 when first examined, but it had fallen to 20/200, and improved later to 20/100. He had a central scotoma with a good form field.

**Galtung** discusses the connection between disease in the nose and in the eyes, especially affections originating in the nasal accessory cavities and involving the optic nerve but without causing an abscess in the orbit. In the case of a man of 45, both the sphenoidal and ethmoidal sinuses were affected, and this was especially responsible for the optic nerve trouble. Vision was considerably reduced, and there was peripapillary and paracentral scotoma. As soon as the accessory sinuses had been cleared out on one side the scotoma on that side subsided, but on the other side it persisted unmodified until this side had also been operated upon. The scotoma then subsided entirely and vision improved. **Galtung** called attention to the fact that it is exactly 100 years since **Beer** first pointed to the close connection between diseases in the nose and in the eyes.

**OPTIC ATROPHY.**—A case of bilateral optic atrophy in a seven year old boy is reported by **Weber**. He was able only to count fingers in a good light. There was horizontal nystagmus. Both pupils were moderately dilated and neither of them responded to light nor accommodation. Ophthalmoscopic examination showed nearly complete optic nerve atrophy in both eyes. X-ray examination furnished no evidence of anything abnormal at the base of the skull. There was no obvious hydrocephalus or cranial deformity, nor were there signs of disease elsewhere in the body. Excepting a doubtful history of injury to the head, there was nothing in the past history of the patient which threw light on the case.

But his blood serum gave a positive Wassermann reaction, and so did that of his mother and of one of his sisters; while another sister had been treated for *congenital syphilis*. **Weber** also reports a case of bilateral optic nerve atrophy in a child three and a half years old. Physically and mentally the child appeared fairly normal. There was a history of infantile convulsions up to the age of fourteen months. The child's blood serum and that of her mother gave a positive Wassermann reaction. A younger brother of the



father was said to have had a blind prematurely born child.

A case of bilateral optic atrophy is reported to **Burns**, which was marked by sudden and complete blindness. The patient, a short time previously had taken a teaspoonful of strong whiskey three times a day, during an attack of tonsillitis. About two weeks later the urine was found to be loaded with albumin and shortly afterwards she had a miscarriage. The optic atrophy was due either to *nephritis* or *alcohol*, but difficult to say which. The vision gradually cleared to 20/200, which the patient declared was as good as it had ever been.

Among 19,893 patients, **Kirkpatrick** observed 44 cases of optic atrophy. Seven of these were classed as primary, 37 as secondary, but of the latter only three followed acute neuritis. In the other 34 the postinflammatory changes were very slight. Of these 34, 32 occurred in males. None of them gave any history of previous severe illness. In 73 per cent there was reason to suspect consanguinity; but this is very little higher than the percentage of consanguinity in the general population. In 22 out of 26 cases there was a positive Wassermann reaction, and one other patient stated he had had syphilis. In 19 cases the changes affected only the optic nerve head, and of these 17 had suffered from syphilis. The same number gave a history of consanguinity in the parents, and in 15 patients both conditions were present.

**Tomosi** reports *color disturbance* in an amaurotic patient with optic nerve atrophy. The patient stated that on one day he had yellow vision and on another day blue vision. On the day with yellow vision, the patient felt warmer and thought he saw better, while on the day with the blue vision the opposite was the case.

Two cases of *Leber's disease*, occurring in a brother and sister, are reported by **Pollock**. X-ray examinations of the sella turcica showed almost identical conditions in both patients. There was a shadow like a very small bean, with the concavity downwards, situated in, but a little below, the cen-

ter of the sella turcica. The diagnosis of *Leber's disease* was based on the condition of the optic nerves, the absence of all signs of hereditary syphilis, the age of onset (11 and 9 years), the character of the fields of vision (central scotoma and some shrinking of the periphery), the relationship of the two children, the almost complete loss of vision under antisiphilitic treatment, and finally the relative improvement after the treatment with organotherapy.

In **Espejo's** case, a man of 49, there was no history of headache or ocular paralysis. The blindness came on gradually first in one eye, and after some time in the other. There had been lancinating pains and some tendency to ataxia for a few months. All the cases from his records teach the necessity for curing the *syphilis* in the secondary stage at least, as the only means to certainly ward off *atrophy* of the papilla from *tabes* later.

A case of optic atrophy in a young Hebrew was exhibited by **Holloway**. General physical examination was practically negative, with the exception of a slightly positive Wassermann reaction. But the man's head was of a modified "tower-skull" type. Right vision, fingers at 15 inches; left vision, 6/15. There was a divergent squint of the right eye, measuring 10° on the perimeter. X-ray plates showed an enlargement and displacement of the sella turcica and the massive bony development of the face. Each disc showed a well advanced atrophy.

**Levy** reported a case of optic atrophy in the right eye of a nine year old boy. Vision was restricted to hand movements at 1/2 metre. No history of any material kind could be obtained. X-ray showed some *enlargement of the sella turcica*, also a peculiar marking of the inner table of the skull, many ridges and depressions.

In a syphilitic patient who was suffering from a hyperplastic sphenoiditis and ethmoidal abscess, an intravenous injection of *salvarsan* was given and two days later vision was very much reduced. Four months later the sphenoid and ethmoid sinuses were opened and

treated, but only a small amount of secretion was ever found there. In reporting this case **Charles** was in doubt as to whether it was a simple syphilitic atrophy of optic nerves coincident with and independent of disease of the sinuses, or that one condition was the cause of the other. He believes it preferable to use mercury injections and inunctions rather than to give salvarsan, where the optic nerve is already involved. It is generally admitted, however, that with normal nerves salvarsan is not neurotropic, because reaction in a nerve requires the presence of spirochetes in the nerve, and access of the salvarsan to the spirochetes which seems to be doubtful.

A case of optic atrophy of traumatic origin, in a man forty years of age, is reported by **Spencer**. The patient gave a history of having been run over by a wagon wheel when eight years of age. The accident rendered him unconscious and he had hemorrhages from mouth, nose, and ears. Since then his vision has gradually failed, and at present time it was R. V. = 6/30, L. V. = 1/60. Visual fields are greatly contracted. Blood and spinal fluid Wassermann's negative. X-ray shows an old basal fracture, but no abnormal condition of the sella, hypophysis or accessory sinuses. General health is perfect.

**Bell** reported the case of a child eight years old, who, a year previous had been struck just below the left eye, and three stitches had to be taken in the wound. Since that time vision in the left eye had steadily declined until at the present time she could detect hand movements at five feet only. There is a simple optic atrophy, caused presumably by a fracture into the optic foramen resulting in pressure upon the nerve.

**Osborne** reports a case of complete bilateral optic nerve atrophy resulting from an electric shock. The patient was an employee of an electric traction company, and accidentally touched the conducting wire on his car, receiving a charge of between 450 and 500 volts. When seen, about two months after the accident, both optic nerves pre-

sented the appearance of a very advanced stage of atrophy.

A case of primary optic atrophy in an 8 year old boy, was presented by **Stilwill**. Vision was R. = 4/20, L. = 4/15. Both nerve heads were white, nutrient vessels on disc faint; not much change in veins and arteries, but diminished in number. Degenerative changes in the retina, especially in macular region; fields contracted for form and color. As there was a positive blood Wassermann reaction, the cause was believed to be syphilitic.

**Gennerich** points out that we must admit two different points of origin of the morbid process in tabetic optic atrophy; the obliterating endarteritis and the infection of the cerebrospinal fluid. **Gennerich** agrees with **Behr** on the subject of the culpability of tabetic optic atrophy, but disagrees with his statement that cerebrospinal syphilis is caused by a spirochetosis of the meninges and their prolongations, and tabes and general paralysis by an infection of the brain substance itself.

**Suker** exhibited two patients with tabetic optic atrophy, both of whom had been treated by ventricular injections of mercury. One man had received three injections, and his field of vision had perceptibly increased. In this instance 60 cc. of ventricular fluid was withdrawn before the injection. He received 1/20 to 1/50 of a grain of bichlorid of mercury and his mentality had decidedly changed for the better. The other patient was also a tabetic who showed an absence of patellar reflexes, but after receiving the mercury injection the reflexes were restored. This man should be considered not a true tabetic but a senile dement, and in contradistinction to tabes, the man would probably maintain his vision and even improve. The cerebral type of lues, particularly in those cases in which one gets a modified type of Argyll-Robertson pupil, is the most favorable.

In another patient, a girl of 16, with taboparesis, it was noted that for a year her vision had been rapidly failing, she had become nervous and irritable, forgetful, and showing difficulty



in walking, very dizzy and had severe headaches and more or less lancinating pains. She was given four ventricular injections from ten days to two weeks apart, and the amount of bichlorid of mercury increased from 1/100 gr. to 1/25 gr. Following the injections, the reactions were sometimes pronounced within 12 to 24 hours, necessitating a spinal puncture and the withdrawal of about 10-15 cc. of the fluid. The patient showed great improvement in every respect after five months, with vision remaining the same.

The epoch making innovation of the treatment of primary optic atrophy by means of intraventricular therapy, as advanced by Schoenberg has led **Goldenberg** to treat a number of patients by this method. Because of the fact that spirochetes exist in the central nervous system, cerebrospinal fluid and in the blood, one has a logical basis to reason that they will be found in the optic nerve at some not distant

date. That this is a rational method of treatment is borne out by the fact that the endothelium covering the choroid plexuses acts as a barrier to many drugs used in the treatment of lues. Also the fact that the cerebrospinal fluid circulates through the spaces of the brain down to the spinal canal, leads to the conclusion that injections into the spinal canal would be compelled to rise against the current.

In the case reported, the patient received five injections in the course of three months. The patient died four months later from general paresis. In spite of this heroic treatment not only was no harm produced, as evidenced from reports from the attending physician of the institution where he was confined, but the usual progressive process of atrophy was for a time at least arrested. Limited vision was present practically to the very instant of death, where otherwise total blindness in all probability would have been the result without this method of treatment.

## VISUAL TRACTS AND CENTERS.

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This section reviews the literature to June, 1918. Closely allied topics are considered under Optic Nerve, or will be taken up under the head of Injuries in a subsequent number.

**PHYSIOLOGY AND PSYCHOLOGY.**—**Parsons**, writing on the *apocritic principle* and the evolution of visual perceptions, suggests that the earliest outward and manifest sign of the differentiation to luminous energy is the development of pigment cells on the surface of the body. The appreciation of movement is the prime function of the visual organs, the tactile element having become specialized to respond to luminous stimuli. The appreciation of movement by the skin and by the retina is characterized by a successive stimulation of serial end organs. "Apocritic principle" is the term applied by Parsons to the cerebral grouping of visual perceptions.

The essay by **Lippincott** on the *binocular metamorphopsia* produced by optical means largely covers the same ground as a paper published by the same author in 1889 on the binocular metamorphopsia produced by correcting glasses. The condition giving rise to binocular metamorphopsia is described as a disturbance in the relation between direct and indirect convergence. The dissimilarity may take one or both of two forms: First, inequality in width, as produced by spherical glasses or by cylinders with axes vertical or horizontal. Second, want of parallelism between the images of the vertical lines which help to make up every surface. The want of

parallelism may be seen either as a difference in the angle of inclination, the effect of cylinders with axes oblique; or as a difference in form, the effect of prisms.

**Compère**, in a paper entitled "The Effect of Harnessing Up Indirect Vision," puts forward the idea that by overcoming *indirect vision* when one desires to concentrate on a special field or object it may be possible to relieve a spasm which often produces blurred vision, headaches, reflexes, and even muscular defects. The new methods of treatment by which **Bates** claimed to relieve a case of blindness of many years' standing is somewhat too impalpable to be given definite statement here. To the ordinary mind the result would appear to have been achieved by psychic control of the patient, altho the title "central fixation" is given to it by the author.

**Lenz**, writing on the histologic *localization of the visual center*, suggests that the question whether peripheral blindness is later followed by degenerative processes in the central terminal apparatus of the visual fibers in the occipital lobe has not yet been solved. The very exact studies of the writer, well illustrated by microphotographs, indicated specific pathologic changes in the cell structure of the calcarine fissure of blind persons; but only in the internal granular layer and in the pyramidal layer. These changes consisted of a pronounced rarification, increasing in intensity above. The findings favor a localization of the macula, and of its immediate vicinity, in the posterior section of the calcarine fissure. The mode of origin of the cortical change is explained by the writer as a sort of atrophy from inactivity, resulting from the absence of visual stimuli.

The note by **Rider** works out an analytic expression for the equal parallax curve showing the distances that a man and a bird must move forward to give the same apparent displacement of objects against the horizon, for either frontal or lateral vision.

The paper by **Franklin** aims to show that *stereoscopic and perspective* vision are essentially different, tho they complement each other in a rather complicated

manner. He emphasizes the argument that it is not mere dissimilarity of pictures which produces a sense of depth in looking thru the stereoscope, but the play of the muscles of convergence; and that the same is true with regard to the stereoscopic appreciation of real objects. As an experimental proof of this he suggests the following experiment: A stereoscopic picture card is bisected and the relation of the pictures reversed so that their outer edges are approximated together. Viewed thus, as near to the eyes as is comfortable, there gradually appears the peculiar effect of the view being turned "inside out," the relative distance of foreground and background objects being reversed.

**WORD BLINDNESS.**—The case of *congenital word and letter blindness* without aphasia described by **Weber** was in a boy of ten years. There was the usual ability to recognize Arabic numerals, but an extreme backwardness in arithmetic. The patient had learned to write and to recognize his own name. There was no word deafness and no aphasia. The eyes were normal and the patient was not color blind. His mother had been somewhat backward in learning to read as a child. The patient's brother was not word or letter blind. The Wassermann reaction was positive in the mother and the two children, and the father had died at the age of thirty-seven years in a lunatic asylum. Apart from the word blindness the boy seemed intellectually almost normal. In another case described by Weber, the boy had apparently had a relatively mild attack of cerebrospinal meningitis or of acute encephalitis at the age of two years. The damage probably thus resulting to the cerebral cortical speech centers had resulted for a number of years in partial aphasia and dysarthria. Recovery finally occurred, this being attributed by Weber to a gradual process of compensation and reeducation.

**Billström's** patient was a man of sixty-five years, with marked arteriosclerosis, who six weeks before coming into the hospital had had a short apoplectic seizure. The cerebral symptoms were a general psychic torpidity, complete verbal alexia, partial literal alexia, inability to form words out of letters, to read



what he had written, and inability to copy what was written. The ability to write spontaneously from dictation was retained. Death occurred a month later. Postmortem examination showed softening of the angular gyrus of the left side of the brain.

Several cases of developmental alexia or congenital word blindness are related by Heitmüller. Two of the patients had letter and word blindness, while the other two knew the alphabet but could not read or spell words of more than one syllable.

**MIRROR WRITING.**—**Symns'** case of mirror writing was observed in a child of six and a half years. She was left-handed, and in addition to being unable to write except in the looking glass manner, displayed a similar defect in drawing; crying bitterly one day because, when asked to draw the story of the three wise men, she was unable to depict them as walking toward the manger. Symns calls attention to the fact that if an attempt be made by the ordinary individual to write simultaneously with both hands, the mind being concentrated on the right hand, the tendency is to produce mirror writing with the left hand. As the left-handed child grows older, and the details of the optical image fix themselves more firmly in the memory, the tendency to mirror writing becomes less marked.

In a paper which is mainly devoted to throwing doubt on the supposed importance in aviation of a healthy condition of the labyrinth, **Fridenberg** suggests the significance in this occupation of such visual factors as hypersensitiveness to bright light, the sharpness of the sense of motion pertaining to the retinal periphery, acuity of vision in reduced illumination, and rapid and accurate judgment of distance, direction, size, and space. **Hughes** reports an apparently causeless case of alleged monocular diplopia, which the patient was in the habit of relieving with a mydriatic before he went hunting.

**Reeves** writes an account of the *evolution of vision*. **Maggiore** presents a general review of the subject of synopsia, or colored audition. **Jordan** tabulates the various *color sensations* suggested to himself, his two sons, and two

other persons by the various letters of the alphabet.

**TRAUMATIC DISSOCIATION.**—An important paper by **Riddoch** deals with the subject of dissociation of visual perceptions due to occipital injuries, with especial reference to appreciation of movement. From a series of ten cases discussed in the second chapter of the paper, Riddoch concludes that in restricted visual fields from occipital injuries where some recovery of vision occurs, the first visual stimulus perceived which can be recorded on a chart as a field is movement. The recovery of vision for movement begins in the peripheral field. Appreciation of movement and recognition of an object are always dissociated in patients in whom recovery of vision can be demonstrated; the field for the former, which is the more primitive perception, being the larger. This dissociation is a valuable aid in prognosis, for when it is absent after a few months have elapsed no recovery of vision occurs.

Case three of the series dealt with in chapter two presented certain defects in visual orientation which are described separately in chapter three, since they seem to throw light on the nature of stereoscopic vision and on the relation of cerebral defects of vision to those of general sensation. The patient was blind in the left half fields, but later became able to appreciate movements in the periphery of their lower quadrants. His ability to orientate in space, things that he saw quite well was almost entirely lost; and thickness and depth meant nothing to him visually. He was at first frequently unable at once to bring objects which he saw into central vision.

At the time that the report was completed, altho the patient had no difficulty in keeping his eyes fixed upon a moving finger his movement was not of the eyes but of the head. He stated that he was accustomed to moving his head about when he read, that he did it unconsciously. But he had no trouble in keeping his eyes fixed on an object when his head was passively moved, nor in following it with his

eyes when his head was kept fixed by the observer. His visual memory was apparently intact.

Visual orientation, however, was grossly upset. He was unable to localize in space the position of an object seen. He could tell only if an object was very near or very far away. He was able to judge with a fair degree of accuracy the height or length of different objects, but occasionally he made gross mistakes. He was unable to estimate correctly relative distances and lengths, and the answers were equally wrong whether the objects were far away from him or near to him; but he never said that the nearer object was the more distant. One day while being tested, he said: "Everything seems to be really the same distance away, for example you appear to be as near to me as my hand." (He was holding his hand an inch and a half from his face and the examiner was sitting about five feet away from him.)

His most interesting defect was inability to appreciate depth or thickness in objects seen. Persons looked at had color and light and shade, but to the patient presented no protruding features, everything being perfectly flat. One result of this phenomenon was that friends were recognized only by their voices. A sphere appeared merely as a circle, a cylinder as a flat rectangle, a cube as a square, and a pyramid as a triangle. With all this he possessed binocular vision. His own expression was that something else that indicated depth had been taken away.

Defects in spacial discrimination, similar in character to the visual dissociations described, were evident in the patient's right hand. Localization of a touch was defective in the first three fingers. Each finger had to be passively moved on an average thru eight or nine degrees before he was conscious that the position had been altered; whereas he recognized a change of posture when a finger of the left hand had been moved thru one degree. Appreciation of relative thickness of things was not nearly so acute with his right as with his left hand.

Riddoch's general conclusions are briefly as follows: Movement should be given a place among the stimuli which are recognized as originating visual perceptions. Light and movement are the first stimuli to be appreciated in a recovering visual field. The fields for movement, charted at intervals, give the earliest indications of recovering vision. Where no movement is perceived after an interval of some months has elapsed, the affected field will probably be permanently blind. Recovery for the appreciation of movement begins at the periphery of the field and extends inward toward central vision. The types of visual dissociation exhibited are analogous to the dissociations of general somatic sense impressions, described by Head and his coworkers as occurring from cerebral injuries.

**CEREBRAL LOCALIZATION.**—In seven of Riddoch's cases a consideration of the probable damage to the brain along with the charts of the visual field yields facts which support the contentions of Holmes and Lister on *cortical representation of the retina*, namely that macular vision has its center in the posterior part of the visual area; that the macula, like the rest of the retina, is not represented bilaterally in the cortex; that the cortical center of the peripheral zones of the retina is in the anterior part of the area striata; and that the superior quadrants of each retina are represented in the upper, and the inferior quadrants in the lower part of each visual area.

Holmes' paper on visual localization and orientation is based upon a series of cases in which disturbance of the fields of vision was due to injuries of the visual cortex of the brain. In hemianopia due to slight injuries of the parietal regions, a daily recovery of the field from the center to the periphery had been noted. Such injuries were probably of the nature of contusions, possibly associated with edema, capillary hemorrhages, minute lacerations, changes in the myelin sheaths, and even a molecular disturbance of cells, but evidently without permanent anatomic loss.



Holmes elaborates the following conclusions as a working hypothesis for further investigations: The upper half of each retina is represented in the dorsal, and the lower half of each retina in the ventral, part of each visual area. The center for macular or central vision lies in the most posterior part of the visual areas. The macula has not a bilateral representation. The center for vision served by the periphery of the retina is situated in the anterior portions of the visual areas, and the concentric zones of the retina from the macula to the periphery are probably represented in this order from behind forward in the visual area.

Severe lesions of the visual cortex produce complete blindness in the corresponding portions of the visual fields. If they cause incomplete amblyopia, color vision is generally lost and white objects appear indistinct; or a condition may arise in which only more potent stimuli, such as objects moving abruptly, excite sensations. The defects of vision in the fields of the two eyes are always congruous and superimposable, provided that no disease or injury of the peripheral visual apparatus exists. Lesions of the lateral surfaces of the hemispheres, particularly of the posterior parietal regions, may cause certain disturbances of the higher visual perceptual functions with intact visual sensibility, as loss of visual orientation and localization in space, disturbance of the perception of depth and distance, visual retention loss, and visual agnosia.

The paper by Marie and Châtelin on visual disturbances due to lesions in the intracerebral optic fibers and the visual cortical areas following injuries of the head by projectiles is abstracted from the French by Camp in the following terms: The patients studied were those in whom injuries to the occipital region by bullets or pieces of shell caused disturbance in the visual fields. Each case was studied by X-ray to show the exact location of the projectile if it remained, or to show the site of the opening in the skull if it had been removed by trephining.

Five cases presented lateral *homonymous hemianopia*. One case showed lateral *homonymous hemiachromatopia*. There were two cases of cortical blindness in which vision later returned but with extremely retracted visual fields. In five cases there was inferior horizontal hemianopia but with more or less irregular fields. This condition is to be attributed to injury to the superior lip of the calcarine fissure. There was no case of superior horizontal hemianopia, probably for the reason that the inferior lip of the calcarine fissure is so near the cerebellum and the lateral sinus that an injury in that region is fatal. Quadrant anopia is not uncommon.

Hemianopic *scotomata* are divided into three categories: First, macular and paramacular; second, purely macular; third, multiple. The perimetric examinations are most important, because the patient is usually unconscious of the nature of his trouble and complains only that his eyes tire rapidly or that he has difficulty in reading. From a study of these cases it appears that the macula is represented in the cortex at the point of the occipital lobe. The hemianopic scotomata were homonymous, but not mathematically identical. Among the cases difficult of interpretation were cases of ring scotomata or double ring scotoma.

Out of three hundred cases of head injury examined thirty-one showed changes in the visual fields. In some of the others the occipital lobe was injured, but in these cases the projectile was either deep in the occipital lobe or on the external surface. The opinion of Henschen that the visual cortex is confined to the region of the calcarine fissure is confirmed by these observations. In the majority of cases the X-ray examination showed an intracerebral projectile. An increase in the scotoma indicates abscess formation and operation is then advisable. In other cases an operation usually increases the scotoma and is therefore not advised.

In the case described by Abelsdorff, a wound of the occiput was followed by a small left paracentral hemianopic

scotoma which, during the healing of the wound, was transformed into a bilateral central scotoma, without the presence of any other anomaly of visual acuity. This production of a central scotoma in both eyes by a wound of the optic center satisfies the author of the correctness of the contention of Henschen and Wilbrand as to a specialized cortical correspondence with the fovea centralis.

The conclusions of **Beauvieux** as given in his serial treatise on visual troubles in wounds of the visual sphere do not differ essentially from those of Marie and Châtelin. He is satisfied that the *visual cortical zone* is localized in the posterior part of the brain, in the occipital region; this zone being apparently limited to the internal surface of the occipital lobe, the calcarine fissure, and the superior and inferior margins of this fissure. The external surface of the occipital lobes does not form a part of the cortical centers of vision. The grouping of the fibers is in quadrants, the fibers being placed in the same order as in the retina, with isolated conduction for the superior or inferior quarter of each retina.

According to this anatomic conception, *circular hemianopic scotomata* can be explained only by a symmetric and bilateral disturbance of the radiations with special grouping of the nerve bundles innervating a circular retinal zone, or by destruction of fibers of association uniting by the intermediary of the corpus callosum two identical portions of the visual centers, or finally by a purely functional syndrome without a true lesion of the optic tracts. The circular bundle does not appear to Beauvieux to have a precise and circumscribed localization at the level of the calcarine fissure. The macular fibers seem rather to radiate in a fan over the whole visual cortical surface.

**THE LATERAL FIELDS.**—The name "temporal crescent" is applied by **Behr** to the outer rim of the temporal field of each eye which extends beyond the nasal field of the other eye when the field of the one eye is laid upon that of the other. His paper relates to ho-

monymous hemianopias with unilateral defects in the purely temporal crescentic area of the binocular visual field. The centripetal fibers from this semilunar area do not take part in the mingling of the remaining fibers, but run in a separate bundle to the cerebral cortex, where their projection likewise is taken care of by a special area. **Behr** observed five cases in which at certain stages of the disease a defect in the temporal crescent was the only sign of an affection of the central optic tract. A unilateral absolute or relative defect in the purely temporal visual area, together with concentric contraction of the color boundaries in both of the coinciding halves of the visual fields, justifies the assumption of a disease of the central tract. **Behr's** cases support **Wilbrand's** theory of the cortical projection of the macula.

The contention of **Wilbrand**, that the nerve fibers which supply the temporal crescent of the visual field pass in a bundle separate from the rest of the optic nerve fibers, between the chiasm and the occiput, is also supported by **Fleischer**, who further maintains that these fibers retain their separate position in the occipital lobes, and also have a separate area of distribution to the cortex of these lobes. In one case of shot wound of the occiput which he describes, the temporal crescent of one eye was destroyed by a shot lying just beneath the cortex of the lobe, whence it was later removed. In two other cases, the crescent was partially preserved, in one case after the extraction of a bullet from the occipital lobe, in the other after the formation of an abscess following a shot wound.

**PERMANENT HEMIANOPIAS.**—**Uthoff** summarizes the findings in forty cases of shot wound of the occiput, three-fourths of which were complicated by hemianopic visual troubles. In only one of these cases did permanent total blindness follow the wound, and in this case optic atrophy was the final outcome of a complicating meningitis. Only one of the patients had to be classed as economically blind. Four patients died. Inferior hemianopia was much more common than superior,



of which there was only one case. Only isolated examples of visual fields which were not hemianopic in character were met with in this series of cases. Primary transient blindness and primary loss of consciousness were very common. The ophthalmoscopic appearance was usually normal. Pupillary and muscular disturbances were relatively rare. In a few cases hemianopic hallucinations were observed. All but one of the patients were unfitted for further service in the field.

The paper by **Axenfeld** on hemianopic disturbances of the visual field after shot injuries of the skull is complementary to that of **Uhthoff**. Eight cases are discussed, in half of which there was double hemianopia without paresis in other regions. In four cases the lower half was influenced in a more pronounced manner but not exclusively. In persistent injuries of the visual centers, the upper parts near the calcarine fissure are apparently more exposed than the lower ones. In several cases the patient was unable to return to work at his trade; in one case the available vision being insufficient for any work, while in another case, in spite of perfect central visual acuity, the lower segment was so affected as to interfere with the working ability. In one case there was a choked disc which was not due to a cerebral abscess, but was provoked by the trauma, which was also responsible for the destruction of cerebral tissue and for hemorrhages.

**TRANSIENT AND PARTIAL HEMIANOPIAS.**—Upon the basis of seven cases which are described, **Hine** discusses the recovery of fields of vision in concussion injuries of the occipital cortex. He finds that in the case of an injury at or near the occipital pole, the hemianopia is very frequently complete, macular escape being less commonly encountered than in the majority of civil cases of lesions producing hemianopia. In **Hine's** experience the field of vision never returns in the lower quadrant before the upper, but always vice versa, this being due to the fact that all the injuries recorded by him have been above the occipital pole, which is situated as a

rule about one inch above the inion. Since restoration of color perception appears to come later than that of perception of white, it is important, when investigating any patient suspected of having had an occipital cortical injury, to use small colored test objects as well as the white, as otherwise a partially recovered lesion may quite readily be missed and the fields recorded as complete.

**Piéron** argues for the existence of at least three degrees of cortical hemianopia, basing his argument upon the case of a soldier who was injured in the left occipital region from the explosion of a shell. The apparently blind half of his visual field proved in reality to possess vision of large shadow masses, or very luminous surfaces belonging to this part of the field. The boundaries of light vision in the anopic field, provided sufficiently intense luminosity was employed, were the same as those of the normal field. There was, however, in this blind half of the field achromatopia and asteriopia, or loss of vision for colors and loss of vision for form and size. **Piéron** would thus recognize in cases of hemianopia the following three degrees: In the lightest cases, hemiachromatopia; in more marked cases, hemiasteropia; and for the complete cases, especially with radical destruction of the center or of the optic tracts, hemiaphotopia, or complete hemianopia.

The patient of **Cosse and Delord**, a soldier injured by the bursting of a shell, showed a right homonymous lateral hemianopia, complicated by hemianopia in the left inferior quadrant, so that three quadrants out of four in each eye were anopic. There was no aphasia, and very little hemiplegia. Altho he possessed normal visual acuity in each eye, his gait and behavior were those of a blind person. A number of bony fragments were shown by the X-ray to be imbedded in the brain. In their passage thru the brain, these bony fragments no doubt injured the region of the right and left calcarine fissures. The patient's incapacity for work was estimated at sixty-five per cent.

In a case reported by **Wilson**, a blow on the back of the head from a shell fragment was followed; first by loss of consciousness for three minutes, later by blindness for from forty to forty-eight hours, and last, as the vision improved, by concentric diminution of both fields, both for white and colors, and also a marked condition of visual fatigue, so that excellent examples of a helicoid curve were obtained with both eyes. It must be borne in mind, says **Wilson**, that concentric diminution, supposed to be characteristic of hysteria, does certainly occur from head injuries, as in two of the cases cited by **Marie** and **Châtelain**. In all of these cases there was no trace of the hysteric psychoneurosis. These symptoms are probably the expression of an organic change, the basis of which is a violent commotion, or a concussion amounting to contusion of the visual cortex, or of the subcortical visual projection system.

In a paper which considers both the organic visual disturbances, and those of a functional character which may be due to autosuggestion or heterosuggestion, both occurring in patients who have been subjected to traumatism by concussion or contusion, **Coutela** submits the following rule for the handling of these cases from the military point of view: They should not be evacuated from the front unless they have actual lesions. If so evacuated they should be kept under observation at a special center, where they should be examined by a neurologist and an ophthalmologist. No certificate of incurability should be delivered in the case of a soldier in whom the visual trouble does not correspond to clearly established objective lesions, or to a recognized organic syndrome. After the war the state may discharge these cases without compensation, but should rehospitalize them if they so desire.

**COMPLICATED HEMIANOPIAS.**—The patient whose case is discussed by **Morax** was injured in the right occipital region. His ocular symptom complex included left homonymous hemianopia, neuroparalytic keratitis, and paralysis of the dextrogyrators. The hemiano-

pia is explained by the presence of a large fragment at the level of the right occipital lobe, the keratitis by the action of a right cerebellar abscess, an extension of which affected the region of emergence of the trigeminus, and the paralysis of the oculogyrators either to the traumatic cerebellar lesion or to the development of the abscess in such fashion as to affect the nucleus of the sixth pair.

**Pincus's** clinical observations of shot wounds of the occiput showed optic neuritis in only three out of twenty-two cases. The intensity and extent of the functional trouble were often disproportionate to the amount of external injury demonstrable. A typical picture of homonymous hemianopia was present in eight cases. A case of optic aphasia and rightsided hemianopia did fairly well after the shot had been removed from the left occipital lobe. In a patient who presented peculiar fatigue symptoms, relatively dark portions of the visual field became absolutely dark during epileptiform fits. In a case in which there were symmetric scotomata in the left upper quadrant, radiography showed a piece of a bomb shell, not in the cortex, but in the optic radiations. The author believes that symptoms of fatigue are not always to be attributed to a hysteroneurasthenia; but may in many cases be the expression of organic injury of the visual centers.

**Von Hippel** emphasizes the need for differential diagnosis between choked disc and papillitis in every case of shot wound of the brain, wherever possible. Conditions favoring increased intracranial pressure are present after shot wounds of the skull whether the dura has been wounded or not. All swellings of the disc seen early after such wounds, although mentioned under various names in the literature, are really choked disc. The later swellings of the disc are more usually due to cerebral abscess, meningitis, or a cyst, and may be either choked disc or papillitis. Choked disc in the early stage of such injuries does not call for operation. But in cases where operation is otherwise necessary, the opportunity



is often afforded to see prompt retrogression of the choked disc. Swelling of the disc in the later stages is a sure indication that cure was only apparent, and calls for surgical intervention.

A general consideration of the subject of hemianopia is presented by **Lloyd**. He describes several cases which were connected with arteriosclerosis or nephritis, and some space is devoted to the anatomy of the optic tracts.

**Schirmer's** patient suffered for a few days only from a left sided homonymous hemianopia, from which she completely recovered. The extraordinary feature of the case was that during the attack there occurred *optic hallucinations*, principally consisting of the images of human beings all of which moved with considerable speed toward her left side and there disappeared. There was never any mental disturbance, the patient not even being of a nervous type. She was a woman of forty-five years. **Schirmer**, viewing both the hallucinations and the other features of the case, concludes that the lesion was located in the right occipital lobe in the vicinity of the psychopathic center, and that it was in all probability due to a thrombosis.

A case of bilateral *quadrant anopia* is described by **Tyson**. The patient was a woman of fifty-three years who had chronic interstitial nephritis with high blood pressure, and with an albuminuric retinitis. The defect was in the right inferior quadrant of both eyes, and is regarded by the author as being due to a lesion in the region of the cuneus.

**Cohen** reviews his pupillary findings in twenty-four fatal cases and fifty-one nonfatal cases of fracture of the skull. He found *inequality of the pupils* with absence of light reflex to be very common in fatal cases of fractured skull, but comparatively rare in the cases that recovered. He advises that where there is inequality of the pupils associated with unilateral amblyopia or amaurosis in the eye the pupil of which is dilated, one should recognize the possibility in this eye of subsequent descending primary optic atrophy. Contrary to the usual observation, choked disc was not observed in any of his cases.

**Weber** reports the association of cerebral degeneration and epileptiform fits with amaurosis, in an only child of Hebrew parents, at the age of six and three-quarter years. The vessels and optic discs resembled what one sees in cases of retinitis pigmentosa, but without the characteristic pigmentary change of fully developed retinitis pigmentosa. The fits were transient epileptiform of the petit mal variety.

**CRANIAL DEFORMITY, OXYCEPHALY.**—**Bedell** describes the condition of three members of the same family, the youngest of whom showed optic atrophy, the middle one optic neuritis, and the oldest only a moderate suggestion of cranial deformity. The father of these children had died at the age of thirty-eight years from general paresis, and the mother at the age of thirty, probably from acute alcoholism. In the second of the three children, a boy of eight years, it was possible that the disease had been present at birth, altho both optic nerves were swollen at the time of examination. In the youngest child, a girl of seven years, there was advanced optic atrophy, altho there was a record of the child's head having been normal until she was past two years of age. In the second child a subtemporal decompression was done with fatal outcome in a few hours. The paper is well illustrated. A case of tower skull with double optic atrophy is recorded by **Goldenburg**, who furnishes cranial measurements. **Lewin's** paper contains records of two cases, one in a girl of fourteen years of age, who was brought to the hospital because of blindness, weakness, and enlargement of the head, and who was the tenth child in a family of thirteen children; while in the other cases, that of a boy of six years, the complaint as given by the mother was of stiffness of the neck, headache, bulging eyes, and lateral retraction of the head. In both of these cases there was marked exophthalmus and pronounced cranial deformity, the measurements of the crania being given.

**VISUAL FIELDS IN PELLAGRA.**—**Calhoun** describes the ocular findings and illustrates the visual fields in three cases of pellagra, and states that in most cases

of pellagra there is a contraction of the field of vision for form and color, with frequently an interlacing or misplacement of colors, especially the green and red; and further that in a relatively large proportion of the cases there is a scotoma for red and green and occasionally for all colors. These scotomatous areas do not necessarily occur in the typical or acute cases, having been detected in two patients before a diagnosis of pellagra had been made.

**HYSTERIC BLINDNESS.**—In the extraordinary case recorded by **Camp** the hysteric blindness had existed for five years, from the age of fourteen to nineteen years. He had been at a school for the blind for three years, and had learned to read and write by the Braille system. He was sent to the clinic because of the development of a peculiar condition in the legs which was also hysteric. Both conditions were cured, at least for the time being, by static electric treatments.

**PSYCHIC BLIND SPOT.**—**Lohmann** rejects as untenable the assumption of some physiologists that the physical blind spot corresponds to a psychic one in the psychic visual field. Altho the blind spot has been perceived entoptically, he concludes that adequate proof has not been furnished to demonstrate defect or contraction of the psychic visual field. He also discusses the relations of the space values of the retina to the point of fixation and to the blind spot.

**AN OPTICAL ILLUSION.**—Discussing the fact to which attention was called by Mizuo, that two straight crossed lines appear to be interrupted at their point of intersection and also to be bent in that region, **Nakamura** has determined that for the production of this phenomenon the following factors are necessary: The visual angle of the straight crossed lines must be from ten to fifty-eight seconds. The greater the difference in luminosity between the lines and the background, the clearer the phenomenon. The illusion does not appear if both elements represent contrast colors. The angle of intersection between the lines must lie between five and forty-five degrees. The cause of the phenomenon lies primarily in the contrast between convergence and divergence.

**HYPOPHYSEAL DISTURBANCES.**—**Wallis** gives the results of his anatomic studies of eleven subjects with regard to the relations between the optic nerves and chiasm on the one hand and the sphenoid bone on the other. In no case did the chiasm rest entirely upon the optic groove. In one instance rather more than half of the chiasm rested upon the optic groove and the olivary eminence, and the posterior half on the pituitary body. In another case the chiasm was far enough forward just to touch the olivary eminence. Wallis concludes that the chiasm is nearly always completely posterior to the optic sulcus. The measurements of the chiasm varied from seven millimeters to eleven millimeters anteroposteriorly, and about three millimeters less laterally. The intracranial part of the optic nerves varied between seven and twelve millimeters in length, and the angle formed between the two nerves was more acute with a more posterior situation of the chiasm. When the chiasm was relatively far forward the angle became U-shaped.

**Walker and Cushing** record eight cases of *homonymous hemianopia* due to hypophyseal tumor. In some of the cases remarkable improvement in vision followed the transsphenoidal operation. But taken altogether, the results from operation as regards improvement in vision were not so satisfactory in this group as in the bitemporal class of cases. This the authors suggest is accounted for by the fact that most of the lesions in the homonymous group are tumors rather than strumas, and have a tendency to grow less symmetrically.

The findings by necropsy in three cases of hemianopia are recorded by **Bassoë and Raulston**. In the first one there had been a right hemianopia. There was a tumor (glioma) measuring three by two by two centimeters on the external surface of the left parietal lobe in the region of the angular gyrus, and another tumor of similar appearance occupied the mesial and most anterior portion of the occipital lobe and extended in the parietal lobe as far as the level of the anterior end of the pons. In the second case the chief findings were left hemianopia and partial



left hemiplegia. A metastatic carcinoma measuring five by six centimeters was found extending from the occipital pole forward to within four centimeters of the tip of the temporal lobe. The calcarine fissure was involved only at its extreme posterior end. The third patient had had a right homonymous hemianopia and a partial right hemiplegia. The postmortem findings included pulmonary emboli, syphilitic aortitis, gummata of the spleen and other regions, softening in the right occipital and temporal lobes, and edema of the brain. There was marked atrophy at the pole of the left occipital lobe, the softening in the calcarine region extending inward to the ependyma of the posterior horn.

Traquair's series of papers on bitemporal hemiopia constitute an important brochure on the subject. An ample bibliography is furnished, twenty-four case histories are related, and there are numerous illustrations. The author arrives at the following conclusions: The perimetric defects in bitemporal hemianopia follow a typical or normal course of development. Commencing in the upper outer quadrant, the field is involved in a circular manner, the loss proceeding clockwise in the right field and counter clockwise in the left, so that the upper nasal quadrant remains longest. This is the course in the majority of cases. The central defect develops in like fashion. This type of field defect is due to interference with the chiasmal fibers, but is largely independent of the exact nature of the ultimate cause. The immediate cause is very probably a chiasmal neuritis, a lesion comparable to that which occurs in retrobulbar neuritis. The cause of this neuritis is not definitely known. In many cases it is probably due to pressure. It may be due to contact of toxic substance with the chiasmal fibers, which substances may either be derived from the causal lesion or arise indirectly from pressure. In some cases the chiasm may participate directly in an inflammatory process. The relation of the infundibulum to the chiasm is probably important. In tumor cases and probably in some

others, the disturbance may be due more or less to mechanical pressure. In the later stages the normal type of progress of the field changes may be "swamped" by pressure effects and and greatly altered. The cases cited provide evidence from the clinical side in support of the looped arrangement of the fibers in the chiasm. They may also indicate that the papillomacular bundle forms a little chiasm within the chiasm and that its fibers are similarly arranged.

Blum reports briefly three cases of pituitary disease in which radiographs showed either an enlargement of, or changes around the sella turcica. In the case reported by **Elsberg and Krug** the X-ray failed to show any enlargement of the sella turcica. There was only temporary improvement after decompressive craniotomy; but rapid improvement after pituitrin treatment, with complete relief not only of the cachexia hypophysopriva but also of the hemianopia.

The patient whose case is recorded by **de Schweinitz and How**, a woman of fifty-one years, had suffered since early life from intense headaches which were unaffected by any ordinary treatment. Her eyes had been under observation for fifteen years without showing any pathologic condition. There was blurred vision, and marked pallor of the optic discs. Bitemporal hemianopsia and an X-ray picture showing an enlarged sella turcica, suggested the presence of pituitary body disease. Operative interference being declined, treatment with thyroid extract and pituitary body extract was resorted to. A total of about seven thousand grains of the combined tablets (two and one-half grains each) was taken between July, 1914, and February, 1916. The visual fields were gradually restored practically to their normal extent, the vision of the right eye being raised from 6/60 to 6/5 and that of the left eye from 4/150 to 6/12. The headaches and other symptoms had practically entirely disappeared.

A similar result was obtained by **Timme** in a woman of twenty-three years, who after the visual fields had

returned to normal two years from the beginning of treatment, found it occasionally necessary to combat drowsiness and headaches with small doses of pituitary and suprarenal gland.

In **Parker's** patient sellar decompression with removal of a portion of the pituitary stroma was followed after five days by gradual return of vision, and on the eleventh day central vision was normal and the fields had returned to normal with the exception of an inferior nasal notching. The patient was subsequently kept on pituitary extract five grains three times daily.

**Tenner** presented a case of hypophyseal disease which had been operated upon by Cushing thru a trans-frontal osteoplastic opening. Seven weeks after operation the vision of the right eye had increased from hand movements in the upper nasal quadrant to 20/30, that of the left from 20/20 to 20/15, and the fields had almost returned to normal.

**Kanavel's** paper upon cysts of the hypophysis states that these are the most satisfactory type of tumors of the hypophysis, since operation upon them is technically more simple and the results are superior to those obtainable in the adenomata and other solid tumors. To secure the greatest benefit it is necessary that the tumor should be removed before the onset of puberty. At present, however, the disease is usually recognized by a group of symptoms present some years after puberty. Of the three patients which have been operated upon by Kanavel, two have already been reported.

In the first, a youth of eighteen years of the typical Froelich type of hypophyseal disease, suffering with marked signs of intracranial pressure, six years have now elapsed since the successful operation, the essential part of which was curettement of the cyst. This patient was fed for three years on pituitary extract. There was a distinct but not normal growth of hair, but no evidence of growth in height or size, no

appearance of genital function, and no apparent growth in the size of the testicles. The voice did not become more masculine. The excessive adiposity subsided, and the urinary function was restored to normal except that the sugar tolerance remained above normal at the end of two years.

The second patient, a female of twenty-one years, with the Froelich type of hypophyseal disease, and blind in one eye, developed a streptococcic meningitis and died. The third patient, also of the Froelich type of disease, who came complaining of headaches and failing eyesight, finally recovered after three successive operations with evacuation of a cyst in the sella turcica, following the last of which he developed a basal meningitis which threatened his life for a number of days. This patient became free from his recent acute symptoms, but did not show any development sexually.

The paper is profusely illustrated with drawings showing the steps of the intranasal operation as now done by Kanavel. No matter what method of approach is used the operation is said to be difficult and should be undertaken only after thorough preparation. A temporal decompression for hypophyseal tumor is the subject of a clinical talk by **Speed** before the Chicago Surgical Society.

The subject of pituitary disease is touched upon by **Zentmayer** in an address on the eye and the endocrine organs. **Fisher** describes a case, which in successive pregnancies showed evidences of raised intracranial pressure, including double papillitis, vomiting, severe headaches, and paralysis of the left external rectus muscle, as well as a partial but quite definite hemianopia. This group of symptoms was attributed by the author to an exaggeration of the enlargement of the pituitary body which is normal to the period of pregnancy. Cases of suspected tumor of the pituitary body are recorded by **Hansell** and by **Hughes**.

*(To be Continued)*



# DIGEST OF THE LITERATURE.

## VISUAL TRACTS AND CENTERS

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*(Continued from August issue)*

**TUMORS.**—In a review of seventy cases of brain tumor, in the surgical service of Halsted at the Johns Hopkins Hospital during three years and four months, **Heuer** and **Dandy** re-emphasize two possible causes of late interference in brain tumor cases, namely, uncertainty as to the prognostic significance of choked disc, and the assumption that intracranial lesions are commonly of syphilitic origin. Ten per cent of the patients were blind on admission, and in four others vision was almost gone.

The authors believe that the adoption of the principle that, even in the absence of localizing signs, surgical measures should be contemplated as soon as choked disc can be diagnosed, would in large measure prevent blindness. The time during which choked disc may persist without causing permanent damage to vision is indeterminate. The demonstration of normal visual acuity, as usually tested, should not be taken as an indication of the absence of visual disturbance, which can often only be demonstrated by careful perimetric examination. Contractions in the color fields occur before alterations in the fields for form, and both may occur long before visual acuity as ordinarily tested is demonstrably affected.

In the authors' experience the occurrence of cerebral syphilomata is relatively uncommon as compared with that of true tumors. In the forty cases certified by operation or autopsy only a single case of dural gumma occurred. The Wassermann test was made in fifty-three cases and was negative in fifty. Of the three positive cases, in

one the lesion proved to be a gumma, in one a glioma, and in one it was not certified. Syphilis and true brain tumor may coexist. The chief usefulness of the Wassermann reaction in intracranial conditions, with choked disc and demonstrable impairment of vision, is as a guide for postoperative treatment.

**Knapp** reports a case in which the brain showed a frontal tumor in an enormously enlarged right lobe, which had produced a sacculated distension of the third ventricle and pressure atrophy of the underlying bone in the anterior and middle cranial fossae. Bilateral central scotoma and excavation of structures anterior to the anterior clinoid processes, as shown by X-ray, suggested a definite localization of the tumor at the base of the frontal lobe; but autopsy showed the tumor to be situated at the convexity of the right frontal lobe next to the falx. In a discussion of lesions of the frontal lobe simulating cerebellar involvement, **Gordon** comes to the conclusion that so far as his cases of cyst, sarcoma, abscess, and hemorrhage are concerned, the condition of the eyes could not be taken into consideration for the differential diagnosis.

The experiments by **Sharpe** for the production of increased intracranial pressure with its ocular signs in dogs were along lines similar to those of Horsley many years ago. The condition of hydrocephalus was produced in nine puppies of the age of from ten days to two weeks. Sharpe concludes that the measurement of the pressure of the cerebrospinal fluid at lumbar puncture by means of the spinal mer-

curial manometer is the most accurate means of determining the intradural pressure; and he urges that the intelligent use of the ophthalmoscope, especially by the direct method, should be much more intensively studied in medical schools and hospitals than is at present the practice. **Lamb** presents a careful description of the antemortem and postmortem findings in a case of neuroma embryonale (glioma) of the left lateral ventricle of the brain, in which there was double choked disc.

In a discursive paper on the ocular

symptoms of brain tumor, written for the general practitioner, **Conkey** reports a miscellaneous group of cases of increased intracranial pressure due to a variety of causes. Five cases of intracranial growth are recorded by **Lemere**: In two of them it was possible to localize the tumor absolutely, and in two cases also a decompression operation was beneficial as to vision and other symptoms and probably prolonged life. A review of the eye, ear, nose and throat symptoms manifested in brain tumor is offered by **Kiefer**.

## COLOR VISION.

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This section reviews the literature from January, 1917, to June, 1918. Related topics are considered in the sections on Retina, and Visual Tracts and Centers.

In presenting a resumé of the recent investigations into the subject of color vision, it is not possible to detail here all the facts, physical, physiologic and psychologic, in support of the theories of vision, yet a summary of the important papers now obtainable by the reviewer will be given.

While discussing the apocritic principle and the evolution of visual perceptions, and commenting upon the complexity of the visual functions, **Parsons** calls attention to the fact that the estimation of colors in the field of vision depends not a little upon the intensity of the illumination—the greater the illumination the wider the extent of the field; while under normal conditions there is a peripheral totally color blind zone separated from the central trichromatic area by a dichromatic zone.

The purpose of **Edridge-Green's** paper on the relation of ophthalmology to the theory of vision is to show that every possible aberration of function is represented by a disease of the eye. Vision being photochemical, there should be defects in accordance with

known photochemical facts. The rods having the special function of regulating the photochemical sensitiveness of the liquid surrounding the cones, there should be diseases corresponding to aberration of this function. The visual impulses are set up by the decomposition of the visual purple generated by the rods, acting upon the cones and the impulse itself is conveyed thru the optic nerve to the brain. The character of the stimulus differs according to the wave-length of the light causing it.

In the impulse itself there is the physiologic basis of the sensation of light and in the quality of the impulse the physiologic basis of the sensation of color. The impulses vary in character according to the wave-length of the light causing them, altho the retino-cerebral apparatus cannot discriminate between the character of the adjacent stimuli from lack of development, the power of discrimination varies with individuals and hence the different varieties of color perception which are found.

With reference to erythropsia the well known facts connected with the



maximum of the luminosity of curves varies according to the intensity of light stimulus. Bright light intensifies the red end of the spectrum, while feeble light the violet end. Hence erythroptopia depends upon the influence of very bright light upon the red end of the spectrum. The reversal of color fields depends upon photochemical decomposition of the fluids surrounding the cones, which has been sensitized by visual purple, as well as upon the stimulation of the cones by the products of this decomposition. Red light is not nearly so active in bleaching the visual purple as green or blue, yet when it produces an effect its action is greater. In hyperesthesia of the retina, as in hysteria, we frequently find the red field larger than the blue. He calls attention to Stephenson's observation in regard to the transposition of the red and green fields in xerosis of the conjunctiva, in which the retina is torpid, hence the action of red is more affected than that of green.

Berry in his Bowman Lecture, has endeavored to reduce the discussion of the subject of color sense phenomena to a more definite mathematical formula than has hitherto obtained. He concludes the chain of events leading to color perception may be taken to be something like the following: 1. Biochemical action of rays on the contents of the retinal pigment cells, possibly combined with an indirect light on the retinal cones, thereby. 2. Stimulation of the dual nature of the cones. 3. Nerve conduction from the double cone stimulation by the optic nerve. 4. Central normal cells, in which the combination of the two factors causes different molecular disturbances, which are: 5. Psychically resolved into mental and color sensations.

Further conclusions that may be drawn are: 1. That the existence of fundamental color sensation is improbable. 2. That the transition from polychromatism to dichromatism is more easily explained than is the assumption of a lost or crippled fundamental sensation. 3. That psychologic and congenital dichromatism are essentially the same in causation. 4. That the mole-

cular disturbances in the central visual cells are the same whether evoked by physical stimuli or originating subjectively. 5. That there is a constant interaction taking place between the molecular movements in these cells in contiguous areas, an interaction known as induction, which seems to be independent of the manner in which the disturbances are evoked. 6. That the relation between mental and colored light perception, tho intimate, is not inseparable. 7. That the retinal rods and the visual purple are probably unconnected with color sensation. 8. That the psychical processes evoked by molecular changes in the visual center are subject to other psychical conditions, which may falsify judgment.

COLOR BLINDNESS IN THE PERIPHERAL RETINA.—**Ferree and Rand**, citing a notable case as a text, and the investigations in their study of the color sensitivity of the peripheral retina, confirmed the findings of other observers by discovering in the normal retina areas which are totally blind or deficient for the colors red, green, yellow or blue. They believe that the presence of such spots in the peripheral retina may be considered the rule rather than the exception, altho there may be some difference in the findings of various observers as to the number of the spots, their location and color responses affected.

In their search for the spots a rotary campimeter was used as a means of presenting the light to the different parts of the retina and pigment papers and spectral light in a very intensive stimulation. All colors did not react equally. Lights of a given intensity were sensed as color clear out to the limits of white light vision, for all the colors except the green, yet green could not be made to coincide with the limits of white light vision no matter what the intensity might be. As might have been expected, the only effect of these greater intensities was to narrow the area of the spots previously mapped by means of the pigment paper stimuli; from which, they concluded that the blind areas are frequently bounded by a zone of weakened sensitivity.

During their observations care was taken to keep the intensity of the illumination of the room constant. In the case cited the after images were found to be greatly modified from what had commonly been the case. Ferree and Rand learned by their studies that there was no detectable weakening of the sensitivity to the complementary or antagonistic colors in the areas, and that no more of the color to which the area was blind was required to combine to produce gray with the antagonistic or complementary color, than was needed on the normal areas of the retina immediately adjacent.

In connection with Ferree and Rand's publication, **Ives'** study of the photometry of lights of different colors should not be neglected by those interested in the subject. His observations are of great theoretic and practical importance. His work on flicker photometry reaches a very high standard. Combining his earlier studies he has recently published, in collaboration with Kingsbury, a paper dealing with the theory of the flicker photometer under asymmetric conditions.

**NEUTRAL ZONES IN THE SPECTRUM.**—Studying, by means of a Rayleigh equation, the perception of the spectrum by persons having a normal or approximately normal color sense, **Malling** found all grades of transition from the most highly developed color sense to complete color blindness. Especially he found neutral zones, or bands of relatively weak color perception, at different points in the spectrum. The most frequent of these (12 out of 25 cases) occur in the blue green at wave-length 502; and in the red wave-length 658, 13 cases.

These he regards as relatively weak points of color perception. In many of the distinctly color blind this blue green zone is extended, until in the completely color blind it occupies the whole spectrum.

**VISUAL STIMULATION INTENSITIES.**—**Troland's** paper, which has been written for the experimental psychologist, is a discussion study of certain very general questions with regard to the measurement of the intensity of the

visual stimuli. In discussing the problem of heterochromatic photometry, the author states that photometry in general is really color photometry, since none of the light sources are strictly white and even sunlight varies in hue. The brightness of an illuminated surface depends upon the point of view—by brightness is meant the effect of a given stimulus on a given eye.

When lights of different colors are compared, the brightness must also depend upon the visibility curve of the eye, but this visibility curve will not be the same for different methods of heterochromatic photometry. In his argument the author is inclined to accept the flicker photometer as affording a means of relatively precise comparison between light of all degrees of color difference, yet in proceeding by the flicker to test the value of a visual stimulus, it has been demonstrated that equally bright lights do not always generate equal luminosities.

**Arps** found that the perception of grays is conditioned by attending circumstances, for when composed of the color wheel under a given illumination, they did not remain indistinguishable if the objective illumination was made very faint. Under certain conditions it was found necessary to add a white sector of 25 per cent to the gray composed of blue and yellow, in order to restore equality in brightness. In another experiment two grays matched in daylight were broken up in the dark room and markedly affected by decreased illuminations. Again, they were affected by the character of the contrasting background, as was shown by transposing two rings of gray, the effect being always greater on the outer ring. Especially were changes observable when white card board was placed behind the color. Indistinguishability disappears, therefore, with changed conditions of observation.

**Gibson** bases an explanation of color and color vision upon the hypothesis of electrons, tuned to respond to various rapidities of ether vibration. In the retina these may be conceived to set up chemical changes which in turn give



rise to the nerve impulses interpreted as color. Absence of electrons capable of responding to a certain rate of ether waves would account for the inability to receive a corresponding color sensation.

**TESTS FOR COLOR BLINDNESS.**—**Bos-tröm, Göthlin** and **Ohrvall** review the status of the question of color blindness and compare what obtains in Sweden with other countries. The methods of examination used on the chief railway systems are analyzed and the imperfections noticed. They have devised a test method which they believe will correct the imperfections of the tests now in use, the chief item of which consists of a chart on which are scattered tiny irregular patches of color, of a light and a dark reddish lavender and a dull cherry red. All the dull red patches are arranged in such a way that they form a large figure, 3 or 6. The tones of the red and the lighter lavender being of the same depth the figures cannot be distinguished unless the examinee is able to mark the difference between the red and lavender.

Two of the charts are reproduced and tests with other colors are described. The test here adopted was the most satisfactory. The figures on the charts are to be called aloud, but only 20 to 40 seconds are allowed for the reading of each chart. As the figure is read the outline of it is to be traced. In these charts the figures are very much alike, differing only by being either lighter or darker. The authors make a strong plea for a standardization of color tests and offer a model equipment and outline the procedure of examination.

This plan is essentially similar to that devised by **Ishihara** and described last year (*Y. B. v. 13*, p. 264). His isochromatic plates have been increased in number to sixteen, and arranged in book form, with explanatory text in English.

**TOTAL ACHROMATOPSIA.**—**Wernicke** reports two cases, occurring in brothers, aged 18 and 12 years. The color blindness was complete with some shortening of the red end of the spectrum, red being seen as black. Central vision was greatly reduced, one-

tenth to two-tenths. Daylight provoked continual blinking. If the eyes were kept open in a strong light, after a few moments everything appeared white. Vision was improved at dusk. Nystagmus was present. There was low ametropia, but its correction did not help the vision. These patients distinguished colors to a certain extent by their respective brightness. Ophthalmoscopically the eyes were normal.

**Landolt**, in an extensive account of this rather rare syndrome, found the subjects of it to be hyperopes to the extent of 4 or 5 diopters with astigmatism, and to be amblyopic to a degree not correctable by appropriate glasses. They have had nystagmus also of moderate amplitude of the rotatory type. In the study of the fields of vision it has been noted quite uniformly, that while the extent of the peripheral fields has been ample there have been more or less pronounced small central scotomata. It has been difficult to map out the scotomata because of their smallness and because of the difficulty in maintaining fixation by reason of the nystagmus, and because of the lack of intelligent cooperation of the subjects in the course of the perimetry.

The patients have complained of photophobia and have been the subjects of nyctalopia. The nyctalopia (night seeing) has been of especial interest. It has appeared to be associated with the marked sensibility of the retina to the light, accordingly, the photophobia has been a constant accompaniment. The subject is able to see, not in absolute darkness, but in the increasing twilight to a degree not attainable by the normal sighted. Normal persons require from 15 to 20 minutes for adaptation, whereas the achromatope can see at the end of 2 minutes.

In the testing of the color sense the subject is not asked to name the colors but is to accept a test-skein, a red, for instance, and to select from a pile of many colors reds and allied colors. The color blind will hesitate, will make frequent comparisons and numerous mistakes, selecting the skeins at random.

On his sensorium the colors make only the impression of light.

He cites the case of a soldier, and illustrates his paper by a colored plate showing the bands of colors and a photographic black and white reproduction, of the lot selected by him. In the examination by a projected spectrum, while his perception of the red end might be somewhat shortened, the most luminous division green, the normal will appreciate yellow as the most luminous. In subdued light the region occupied by the greens will be luminous but to the normal they are obscured.

The author then philosophises on the composition of color, breaking it up into saturation and light, the proportions determining the value of the color. An ordinary photographic plate is sensitive to light only of varying degrees, depending upon the obscuration by the color quantity. He ascribes to the retina three principal functions: sensibility to light, to color and visual acuity. Light sensibility is greatest at the periphery and gradually diminishes towards the fovea. Color is perceived most strongly at the fovea and least at the periphery. Acuteness is at the maximum in a limited area at the fovea and diminishes towards the periphery.

All these functions depend upon the anatomic arrangement of the rods and cones—the cones are greatest at the fovea, least at the periphery—the rods are greatest at the periphery and least at the fovea. To the cones belong the property of visual acuteness and the color sense, while light is perceived by the rods. The achromatopes are therefore destitute of cones, and, in other words, can be likened to normal persons in the dark; who are in a sense nyctalopic, for when a bright light is suddenly flashed from out of the darkness, are seized with photophobia and a central scotoma is developed.

When the normal eye is adapted for darkness, under certain conditions as to lighting, the colors make the same impression on the normal as they do on the achromatopic eye. The difference between the retina adapted to ob-

scurity, and the retina illuminated, is in part due to the retraction of the pigment, which protects the nervous elements, and in part to the presence of an abundance of visual purple.

The author ventures to suppose that the nystagmus depends upon the efforts to present the images on the parafoveal regions, and thereby compensate for the central scotoma. Accordingly he regards the nystagmus to be peripheral in origin.

To those who are interested in the subject of color vision, the Editor would recommend the perusal of **Abney** and **Watson's** important paper on the threshold of vision for different colored lights; and **Houston's** interesting theory of color vision, based on the analogy of the selective action of the eye to the forced vibrations of a pendulum.

**COLOR SPECTRA IN THE AGED.**—In a communication to "Nature," **Brudenell Carter**, now in his 89th year, stated that he has noticed, for some time past, before his eyes when directing his gaze upon bright lights, colored spectra in the shape of concentric circular bands—red external, blue internal and yellow intermediate. When the light is near, and so strong as to contract his pupils, the spectrum does not appear, and in like manner the circle is obliterated when he looks thru a pin hole opening.

His refraction is moderately hyperopic and astigmatic, but his spectacle lenses fully correct his visual defect, and he is able to read brilliant type. His color sense is not defective and he has not cataracts. He regards the phenomenon, which has been complained of by other octogenarians, to be dependent upon altered refraction in the crystalline lenses thru the changes commensurate with his advanced age.

Rhineberg, in commenting upon **Carter's** communication, assumes that the cause of the spectra is in some way due to diffraction. The appearance of the blue and red bands, and the diameter of the colored circles increasing in size in ratio to the distance of the light viewed, point to this; both their appearance when the pupil is widely



dilated and their disappearance when the pupil is contracted. He quotes Tyndall's opinion in a case in which the philosopher ascribed the colors to minute particles in the humors of the eye, the increase in size of circles and the vividness of the colors indicated that the diffracting particles were becoming smaller and that they might finally become absorbed.

This explanation Carter does not accept, but clings to his idea that the phenomena are due to lenticular ineffi-

ciency. He cannot account for the presence of a cloud of particles in the ocular media of perfectly healthy, effective organs. He maintains that the occurrence is due to changes inherent with advancing years, for it is not probable that the cloud, if it existed, would be of similar density in the two eyes, or that it could exist without impairment of sight. In his own case the color circles of the two eyes are of equal size and brightness.

## THE EYEBALL.

M. URIBE-TRONCOSO, M. D.

NEW YORK CITY.

This covers the literature of 1917 and to June, 1918. Related matters will be found in the sections on Uveal Tract, The Orbit, and Injuries.

**ANOPHTHALMOS.**—Many cases of this anomaly, formerly considered rare, have been described in the literature of recent years. However, the reports of true anophthalmos, when even a rudimentary eyeball can not be found by dissection of the orbital contents are rare. Zehender denied that a true anophthalmos may exist, stating that in all clinically observed cases of this anomaly, the absence of the eyeball was only apparent, a rudimentary mass or a vestige of the eyeball being always found by means of careful dissection.

Villasevaglios has had the opportunity of seeing a child affected with this anomaly, who died two days after birth. He was able to make also careful craniometric measurements. The child was born at term and well developed. The skull was conical, the forehead very high and the superciliary regions and cheeks protuberant; concealing the orbits and lids on both sides and giving the child the aspect of being asleep. By separating the tissues, a small palpebral aperture could be detected, with lids and some cilia. Behind them was a small cavity lined with conjunctiva, in which no trace of the eyeball could be detected.

Craniometric measurements showed an extreme reduction in the size of the orbits, whose horizontal diameter measured only 15 mm. and the vertical 7 mm. The normal orbit of the new born being respectively 35 and 30 mm. Complete measurements of the skull are appended.

Matson reports another case of anophthalmos, in which neither on inspection or palpation any trace of the eye, or any mass whatever, could be found in the pocket lined with mucosa, which existed in both orbits. Lacrimal fluid existed, probably from the conjunctival glands, as the presence of a lacrimal gland was not evident. A supraorbital notch existed on both sides. No history of heredity could be elicited.

In the discussion of the case Jackson said, it was the most complete anophthalmos he had ever seen. The orbits were very small altho the lids, cilia and conjunctiva showed some degree of development. He could not find any eyeball, altho there might be some embryonic structures at the apex of the orbit. In his opinion the superficial structures are an index of the development of the optic nerve, and since the

lids, cilia and conjunctiva are developed in this case, there must be some rudimentary optic nerve.

McKeown mentioned a case he had under observation, of a baby nine months old with a very rudimentary eye, and asked if the use of a glass shell would help the proper development of the orbit and face. Jackson and Spencer answered in the negative.

Davies contributes an interesting report of five cases of anophthalmia and microphthalmia, and dwells upon the causes of these defects. His first case was a unilateral anophthalmos in a child six weeks old. There was a mucopurulent discharge from the right orbit, which was small and diminished in depth, but otherwise appeared to be normal. The palpebral fissure was only 7 to 8 mm. wide, and occupied the inner half of the lids. The puncta lacrimalia were both present, and a few cilia were present in the upper lid. No eye ball could be detected in the orbit. The conjunctiva was puckered up a little at the apex, where there was a tiny nodule, scarcely the size of a pin head. The presence of this nodule and the lack of dissection makes the author's classification doubtful.

There was, in addition, a marked deformity of the right ear, the external auditory canal being closed and the pinna absent. The face was very asymmetric and when the child cried the mouth was drawn to the left and the facial muscles paralyzed. A small nodule of skin existed on the right side of the neck, a little below and behind the angle of the jaw, which probably marked the position of the posterior extremity of the second bronchial cleft. Otherwise the child appeared healthy. No history of consanguinity.

This case was observed again, four years afterwards, when the right side of the face had grown in proportion with the left and there was no marked facial asymetry. The facial paralysis still exists. Sound was not appreciated in the right ear.

The second case had a bilateral microphthalmia, with the striking feature of a markedly oblique position of the palpebral fissures resembling the orien-

tal type, altho the parents were not of foreign extraction. The right eye was extremely small and both presented coloboma of the iris and choroid. An internal, bilateral nonparalytic squint, associated with lateral nystagmus on fixation, could be observed.

In the third case microphthalmia was more marked in the left eye, in which the palpebral fissure appeared narrower. An incomplete coloboma of the iris was present and a persistent pupillary membrane obscured the fundus. The right eye had coloboma of both iris and choroid, involving the disc. Vision: R. 6/24 under atropin and with +3.5 D. Sph. The palpebral fissures were somewhat oblique, especially the left. No history of consanguinity.

The fourth case presented unilateral microphthalmia with small and inactive pupil, iris discolored and opacity of the lens. No coloboma of the other eye or any other deformity.

Case fifth showed a minor degree of microphthalmos in both eyes, with coloboma of the iris, choroid and optic nerve. Marked lateral nystagmus was noticed since birth.

Davies thinks that anophthalmos is of the same pathologic type as microphthalmos but of greater degree: Because the latter is associated with definite structural defects in the eye due to faulty development or actual failure of development. It is probable that both are dependent on a cause or causes more or less similar in each type.

He groups these causes under four headings: 1st. Inherent defect in the germ plasm itself. 2d. Some condition in the environment of the cell germ, before or after impregnation which is injurious to its proper development. Similar conditions may also exist in regard to the sperm-cell. 3d. Inflammatory or degenerative changes in the eye occurring at a very early date. 4th. Any two or more of these causes may be active in the same case. The author discusses all the primary factors underlying congenital deformities, and does not declare himself in favor of any special theory, considering the question an open one.



**TRAUMATIC PANOPHTHALMITIS.**—Numerous bacteriologic researches have been made in late years in the etiology of traumatic panophthalmitis. These have demonstrated that the most frequent forms are produced by the common pyogenic germs, amongst which pneumococcus is the most frequent. The germs which normally exist on the conjunctiva and the borders of the lids infect the eye, passing thru the wound into the vitreous.

There are, however, other forms of traumatic panophthalmitis such as those observed by **Pereyra**, in which the inflammatory symptoms begin a few hours after the injury and take on a tempestuous course. They are produced by the inoculation of different bacteria which are conveyed into the eyeball by the injuring instrument. These bacteria generally live in a saprophytic way in the air (*bacillus subtilis*, *bacillus perfringens*, etc.), but they become highly pathogenic when they reach the inner part of the eye.

In the author's first case panophthalmitis was due to a lacerated wound of the cornea made with the tip of a whip. The inflammation was of the hemorrhagic type, without pus, and the eye rapidly atrophied and was removed. Smears and cultures proved the panophthalmitis to be due to a *bacillus coli*, highly pathogenic, and to *bacillus subtilis*.

In the second case a wound of the cornea was made with the tip of a wire and a violent purulent panophthalmitis developed. Smears and cultures showed the association of a *bacillus coli* also very pathogenic, with a variety of *bacillus proteus* slightly pathogenic.

**Allport** performed a successful irrigation of the vitreous body in a case of wound of the eye with retention of a piece of metal, which resulted in traumatic panophthalmitis, when the patient absolutely refused enucleation. He made first a magnet operation thru a scleral incision and removed the foreign body from the vitreous. Observing a considerable quantity of pus exuding from the wound it occurred to the author to irrigate the vitreous, which he did using a large anterior

chamber irrigating syringe and removing an appreciable amount of pus. An iridectomy was afterwards performed downward, and the hypopyon washed out. The vitreous was syringed again so thoroughly that the salt solution came out thru the coloboma of the iris and the corneal wound. The eye quieted and three months afterwards the inflammation had entirely subsided and the tension was increasing. The lens became cataractous.

**METASTATIC PANOPHTHALMITIS.**—**Picard** reports 96 cases of panophthalmitis observed at Dor's Clinic, of which several are personal, and reviews the most advanced opinions on the subject. Metastatic panophthalmitis may be produced by infections of "surgical, medical or obstetric origin." He reports 21 cases (among 96) of surgical septicemias, which were frequently associated with suppurating joints, pyelonephritis, erysipelas, paronychia and wounds of the limbs. After these came surgical infections from the digestive apparatus, and last and very rarely those of the pulmonary system.

Panophthalmitis following medical infections was seen in 41 patients. It is more frequent after pulmonary diseases: pneumonia, bronchitis, bronchopneumonia and in gripe. Then come genitourinary diseases and at last digestive disorders. Eruptive fevers, a majority of contagious diseases, typhus, and diseases of metabolism are exceptional. Obstetric infections produced panophthalmitis in 33 patients, ranging second after medical infections.

The most common pathogenic agent in medical infections was the pneumococcus. According to the author's experience the first symptom of the infection is a subjective one: the rapid deterioration of sight, which may be entirely lost in one or two days, in the streptococcic forms, and in three or four in the pneumococcic or other bacterial septicemias. Spontaneous perforation of the globe occurred in 30 per cent of the cases. In 85 per cent the disease was unilateral. Death rate reached 49 per cent in obstetric pan-

ophthalmitis and 33 per cent in surgical cases.

**Cohen** describes a case of unilateral panophthalmitis associated with puerperal sepsis and multiple abscesses thruout the body, in which the examination of the blood revealed the streptococcus hemolyticus. Smears and cultures from the contents of the eviscerated globe showed the same micro-organism. The author points out that, contrary to the majority of cases, the ocular involvement was a nonspecific localization, as evidenced by the multiple abscesses and the unilaterality of the infection.

**Vest** observed another case of unilateral streptococcic panophthalmitis after puerperal sepsis, and **Stapleton** reports a third in which the sepsis was of slight degree, the blood examination revealing only saprophytic bacteria; but the contents of the eye and the discharge from the uterus showed numerous streptococci.

**Siredey** and **Martin** had occasion to observe a case of double panophthalmitis after a very severe cerebrospinal meningitis. The eye manifestations appeared very early, the fourth day in one eye and the fifth day in the other, after the onset of the meningitis. Abundant exudation was formed behind the corneas, which were from the beginning uniformly opaque. The patient died a few days later. **Netter** thinks that the position of the patient has considerable influence in determining the eye which is affected: the side on which he lies for a longer time being the first involved.

**Lawrence** details a case of bilateral metastatic panophthalmitis with fatal issue, following pneumonia. The smears and cultures of the contents of the eye showed pneumococci and streptococci. The author points out the gravity of these mixed infections in which almost always death ensues. He advises the use of serobacterins or a specific serum.

**Dr. Wendell Reber**, in discussion, agreed with the advantages of sensitized serobacterins and emphasized the dangers of vaccines which being foreign proteins are capable of doing

much harm. He also called attention to sinusitis as a possible cause of panophthalmitis, the venous communications between the large plexus at the apex of the orbit, and the veins of the sinus being by way of the nasal vein, which has no valves. Many cases have been reported of panophthalmitis following tonsillitis or otitis media. **Culp** suggested that the involvement of the middle ear and later of the lateral sinus may produce a panophthalmitis.

**Kusama** and **Nakayama** found in the enucleated eye of a soldier, in whom an endogenous panophthalmitis appeared spontaneously accompanied by febrile symptoms, pseudodiphtheria bacilli and staphylococci.

**Oguchi** describes a new bacillus which he considers the cause of a panophthalmitis following an infection by way of an adherent leucoma. The organisms were short, thick rods, similar to bacillus coli, encapsulated and Gram negative; but without any gas formation.

**SPONTANEOUS EXPLOSION OF ARTIFICIAL EYES.**—**Metz** has observed a new case of self destruction of a Snellen artificial eye. As usual the patient heard a sharp report, but this time he thought he had been shot, the bullet striking his artificial eye. Inspection revealed no injury of the lids. The attempt to remove the eye was attended with some difficulty and a slight bleeding occurred from the posterior part of the conjunctiva, which showed an irregular round opening of about 5 mm. in diameter. In the interior of the eye there were a number of small fragments of glass. It is probable that when the globe ruptured the conjunctiva was drawn into the eye by virtue of the vacuum which existed inside and injured itself. This explains also the difficulty in removing the glass ball from the socket. Regarding the cause of the explosion the author refers to the work of **Rochester** (see O. Y. B., v. 13, page 277).

**DISLOCATION OF EYEBALL.**—**Greig** reports a very curious case of idiopathic dislocation of the eye ball in a marasmic child, eleven months old and weighing seven pounds. She screamed



incessantly and it was noticed that when crying all the voluntary muscles, (including the orbicularis palpebrarum on both sides), were thrown into a state of convulsive movement; while at the same time the eyeballs were protruded to such an extent that dislocation appeared to be imminent. When the fit of crying was more violent than usual, or with the slightest touch on the outer canthus, the left eyeball was protruded with a jerk out of the orbit between the lids. The globe could not be voluntarily retracted, but was quite easily replaced by a little pressure. The skull had a normal size and contour and there was no trace of hydrocephalus. The orbits, as far as could be ascertained, had normal size and depth and the globes were not unduly large. During sleep the eyeballs showed no projection.

**EVISERATION.**—**Dimitry** insists in his plea that evisceration and simple

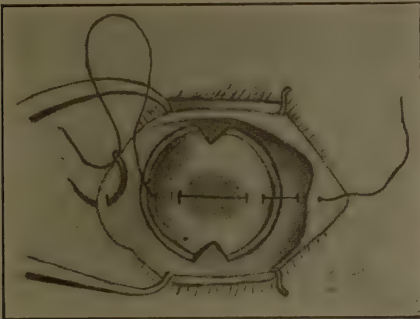


Fig. 1. Dimitry's method of passing the suture after evisceration of the eye.

enucleation are unsurgical procedures, (see *O. Y. B.*, v. 13, pp. 273 and 275), and describes at length the method of evisceration of Hall and Husinger. To eliminate dead spaces after resecting the posterior one-fourth of the sclera and severing the optic nerve, he passes the sutures in the manner shown in the illustration (Fig. 1).

**Hall** details also the same method, which he devised since 1908, and advises to insert in the scleral cavity a small gauze drain which is withdrawn after twelve hours.

**Dianoux** considers evisceration superior to enucleation for war injuries.

It is easier to perform a transverse incision a little forward from the insertion of the muscles, mopping out of the contents of the eye with a piece of gauze wrapped on an applicator, and a drain left for 24 hours in the cavity is all that is necessary. This avoids pain and drains the fluids so abundant at first. Nonexpert hands can do it much better than enucleation, in which cutting again and again behind the globe to sever the optic nerve is a common occurrence. After evisceration the shell is applied by pressure of the air instead of resting upon the lower fornix, which at last produces abrasions and scars.

**ENUCLEATION.**—**Angelucci** points to the great movement now going on in France against immediate enucleation. He quotes **Dianoux**, who wrote: "Since the beginning of the war we assist in a true orgy of enucleations. Every eye with a penetrating injury, with or without consecutive cyclitis, if simply the vision is abolished, is pitilessly removed. No histories, no responsibilities. Enucleation is an operation of repose."

**Dianoux** protests also against this barbarous surgery because sometimes its only object is to shorten the stay of the patient in the hospital and to give him a minimum of treatment. **Weekers** also considers that enucleation is not justified; temporizing it is sometimes possible to save eyes which at first sight seemed completely devoted to enucleation. Sympathetic ophthalmia is becoming more and more rare by the use of aseptic methods. **De Lapersonne** indignantly protested to the Minister of Public Health, against such offences as double enucleation, practiced on the same man, wounded a few hours before.

In such a sad manner, says **Angelucci**, France is now paying the penalty of having proscribed ophthalmologic teaching from the curriculums of her universities. In Italy enucleation has been done rarely. Among 600 soldiers with wounds of the eyes sent to the rear, there were only 77 enucleations. In 510 wounded, **Angelucci** performed enucleation only 38 times. Sympa-

thetic ophthalmia is extremely rare and enucleation is not urgent, except when there is great deformity or infection, or the eye is in pieces. **Carpenter** also thinks that as sympathetic ophthalmia is comparatively rare, many eyes are sacrificed that might otherwise be of some value, at least for cosmetic purposes.

**Valois** describes a new operation for obtaining a larger and more rigid socket base after enucleation. This is of the greatest importance to effect a better transmission of the movements of the socket to the prosthesis. (See *O. Y. B.*, v. 13, page 27.) The operation consists in grafting between the lips of the conjunctival wound a piece of sclerotic taken from the enucleated eyeball. This piece is cut in a rhomboidal shape and inserted folded lengthwise in the middle; keeping it in proper place and position by means of a forceps during all the process of suturing. The threads must include the two conjunctival lips and the scleral graft interposed between them. It is important that the external surface of the sclera shall be in contact with the conjunctiva.

After the operation an ebonite olive must always be inserted in the cavity. The graft has taken well in all cases. In one patient the scleral graft was obtained from the eye of another patient without any inconvenience.

**Dor** as an expert has examined 66 one-eyed men for exemption, of whom 23 had suffered enucleation and 40 evisceration. He inquired from them about troubles in the other eye and obtained the following data: 22 men complained of lachrimation, photophobia, hemeralopia, periorbital pains, asthenopia and other slight disturbances of vision. Of these 21 were eviscerated and only one enucleated. This gives for enucleation 96 per cent of good results and 4 per cent of fairly good, and for evisceration 48 per cent of good results and 52 per cent of moderately good consequences.

The author sees the cause of this slight degree of sympathetic irritation in the presence of the ciliary nerves in the scleral stump after evisceration.

For this reason he prefers enucleation and the use of a paraffin ball or a piece of cartilage according the method of **Carlotti** to improve the prosthesis.

**Dimitry** ascribes the loss of tonicity of the lower lid, principally at the outer canthus; and the ptosis and drawing in of the upper lid, found sometimes after enucleation, to an injury of the sympathetic and its subsequent paralysis, produced by the dislocation of the eyeball between the lids during the operation. He does not support his views by any proofs.

**IMPLANTATION.**—Grafting of dead cartilage after enucleation is an interesting departure of the **Carlotti** method. It was practiced by **Magitot** in two cases of lacerating wounds of the eye caused by projectiles. The cartilage is kept in formalin and may be used even when a moderate infection of the socket exists. There are about 60 per cent of probabilities of success. Histologically the cartilage is insusceptible to attack by microorganisms, and its consistence makes possible the suture of the two lateral muscles, thus providing for lateral movement of the stump.

This procedure is applicable in old as well as recent cases, if the muscles are repaired in such a way that they could be picked out later. When many months after the wounding all inflammatory symptoms have disappeared nothing prevents the removal of the dead cartilage and its replacement by a piece of a living one taken from the patient himself.

Fat implantation continues to be a subject of great interest for improving the prosthesis. In this year **Wheeler, Head and Key** have contributed papers suggesting changes in the technic and giving the late results of former operations.

**Wheeler** advises, before each muscle is cut from the globe, to clamp it at its insertion with a muscle forceps. After cutting the superior and internal recti, both needles of a double armed fine catgut suture are passed from the globe side thru the tendons near the cut ends. Then the inferior and external recti are clamped out and cut, the forceps being



left in place until the enucleation is completed. After depositing the fat in Tenon's capsule, the needles carrying the catgut suture which loops the tendon of the superior rectus are carried thru the tendon of the inferior, entering from the globe side and the suture tied. This results in a slight overlapping of the tendons. A similar maneuver is made with the internal and external recti. Then a purse string suture is made with catgut at the margin of Tenon's capsule and tied. Finally the conjunctiva is dissected a little from Tenon's capsule and sewed vertically by interrupted sutures.

Key also grasps each muscle with a muscle forceps, but before clamping it the conjunctiva is pulled forward well over the muscle attachment when the forceps is clasped firmly upon the muscle including the conjunctiva. Now the muscle is cut free and a catgut suture inserted thru the conjunctiva and muscle from without inward, and then from within outward, well back of the position of the forceps. It is of great importance to place these sutures far outward from the cut margin of the conjunctiva.

The recti are then treated in the usual manner, the fat inserted and a purse string suture of the conjunctiva tied. Across the pouch made by the purse three mattress sutures of silk are placed. The author has performed this operation 15 times with very gratifying results, except in a syphilitic patient in whom there was sloughing and absorption of the fat.

Head following the usual method, (which he credits to Lauber, of the Vienna Clinic), reports 24 successful fat implantations; 23 in Tenon's capsule, and one into the sclera after evisceration. In all of them the results were good. Two cases operated more than five years ago do not show, up to the present time, any shrinking and the excursions of the artificial eye are as good as of the other.

All of these authors agree that the stumps have perfect motility and a good prominence. The shell is held in proper position and tilt, without having to rest on the lower lid. Slow absorp-

tion may go on for years, but enough fat remain to make a good prosthesis. Head gives the credit for fat implantation to Lauber, of Vienna, and Wheeler to "a Mexican surgeon called Barraquer." As it seems there is still some misunderstanding about the originator and pioneers of this method I think it advisable to give the following data:

Fat implantation was used for the first time in 1900-1 by the Spanish surgeon Doctor Barraquer, Professor of Ophthalmology in Barcelona, both after enucleation and evisceration. His methods and results were published in the *Archivos de Oftalmologia Hispano-Americanos*, 1901. After Barraquer the writer published the report of a case of fat implantation after evisceration, with complete success (*Anales de Oftalmologia*, Vol. IV, May, 1902), and performed other after enucleation.

Barraquer's operation was immediately accepted by Mexican ophthalmologists and was made the subject of a symposium in the First Annual Meeting of the Mexican Ophthalmological Society, March, 1903. Dr. F. Lopez reported 18 successful operations, 12 after evisceration and 6 after enucleation. Dr. D. M. Velez reported also 6 operations, 4 after enucleation, 2 in evisceration and one in a contracted socket. All with success. The papers were published in *Anales de Oftalmologia*, Vol. V., April and May, 1903. Dr. O. Wernicke, of Buenos Aires, commenting on Barraquer's methods, proposed the use of a disc of skin with the fat attached in order to obtain a better support for the stump and to make easier the suture of the recti. He either sutured the conjunctiva to the margins of the skin disc or made a purse string suture covering also the skin. His paper was published in *Anales de Oftalmologia*, July, 1901.

These results, however, remained practically unknown in Europe and in this country, notwithstanding they were being quoted in the German Ophthalmic Year Book, until Dr. Bartels, in 1908 advised the use of fat as a better implant after enucleation. (See O. Y. B., v. 6, p. 276.) The main objec-

tion to this method was the slow absorption of the fat and the shrinkage of the stumps, but time has shown that always enough fat remains to give the stump perfect motility and to avoid the sunken lids, which is the chief deformity after simple enucleation. M. U.-T.

**Ralston**, on the contrary, after using fat implantation for the past two years went back to the use of glass spheres, not because fat was unsatisfactory, but because the sphere met every requirement of surgery, with the further advantage of not being subject to shrinkage. The operation is, moreover, easily performed and does not require abdominal incision to procure the fat.

**Risley** has exhibited a man in whom he performed Mules' operation twenty years ago. He still has a perfectly healthy and freely movable stump; there is no thinning of the sclerotic and no tendency to escape of the glass ball. Risley advises for Mules' operation the previous suture of the four recti muscles to the conjunctiva. After the operation a conformer is introduced and a bandage applied.

**PROTHESIS.**—**Valois** asserts that when enucleation has been done, and the cavity is so irregular that a prothesis can not be admitted; it is necessary, first, to remake by surgical interference a good socket, and second, to preserve and to enlarge it. He deals exhaustively with the second point and recommends the use of the special ebonite olives he has devised, (see O. Y. B., v. 13, page 276), with some later changes, specially made to keep them in the desired place during all the cicatricial stage. For this purpose the olive is fixed in one end of a steel rod to the other extremity of which a disc of ebonite is appended, and the latter properly secured with the dressing over the lids. When the cicatrization is thoroly complete, if the cavity is small he advises gradual dilatation with olives of increasing size. To facilitate draining the olives are now made fenestrated, and to obtain a softer contact the edges are finished in soft rubber.

**Terrien** asserts that the better stumps for prothesis are the natural ones; regular, nonpainful atrophic

globes, the posterior segment of the eye and the retracted scleral membranes after evisceration. Unfortunately amputation of the anterior segment of the eye and evisceration are not entirely safe in regard to sympathetic ophthalmia, even after optico-ciliary-neurotomy.

The ideal method is the grafting of cartilage after enucleation, attaching the four recti muscles to the implant. The motility of the stump is perfect, the sunken lid is avoided and the danger of sympathetic ophthalmia eliminated. When grafting is not done the artificial eye must be provided with a rubber shell; or even, if it is necessary with a mould of soft wax, placed behind the shell and worn temporarily.

**Dimitry** suggests to make in the posterior surface of Snellen artificial eyes an opening from four to twelve mm. in size, with smooth edges; in order to produce a moderate suction thru the vacuum brought about by the movements of the lids. The use of a rubber cap upon the artificial eye, with a small opening in the center may give the same results, he asserts.

#### RESTORATION OF SHRUNKEN SOCKETS.

—**Ralston** advises the implantation of a small glass sphere in shrunken sockets of old enucleations. He performs a vertical incision on the conjunctiva at two-thirds the distance from the outer canthus to the center, avoiding the latter, which is generally drawn back to the optic nerve and depressed. The incision is undermined in all directions from the external canthus to a point well beyond the center. Then the deeper structures are incised vertically as near to the outer canthus as possible, the conjunctiva being drawn well back with a strabismus hook. With a sharp knife a slowly executed stab with excursions above and somewhat below is made to encircle two-thirds of the orbit. In this way a fairly large sac is made into which the sphere is placed. This cavity must be made a little above the center of the nasal side. Sutures are made in such a manner that the two incisions do not fall one over the other, the deeper one being well covered by smooth conjunctiva. The sphere needs to be small.



## THE LACRIMAL APPARATUS.

JOHN A. McCaw, M. D., OPH. D.

DENVER, COLORADO.

This section reviews the literature from January, 1917, to July, 1918. Some related matter will be found in the section of Injuries.

**EXTIRPATION OF THE LACRIMAL GLANDS.**—The abundant and continuous epiphora following removal of the lacrimal drainage channels depends, **Calderaro** thinks, in a majority of cases upon hypersecretion of the lacrimal glands. This disturbance ceases with removal of the orbital lacrimal gland and more surely with the removal of the palpebral portion.

After the removal of the orbital gland there is a period from 2 to 6 days during which the conjunctiva is either not at all or scantily lubricated; subsequently this condition improves and the moistening becomes sufficient to keep the conjunctiva normal. Following the removal of the palpebral gland there is abrupt disappearance of the lacrimal secretion. When the conjunctiva is normal its condition of lubrication improves little by little until it is restored to physiologic limits, there being established a vicarious hypersecretion of the subconjunctival glands.

In old chronic trachoma there are always changes in the subconjunctival lacrimal glands; which may in large part atrophy and disappear, in which case removal of the orbital or the palpebral gland may expose the eye to unhappy results from xerosis and conjunctival atrophy.

**Petit** for the extirpation of the palpebral portion of a gland everts the upper lid, and with a curved needle passes the thread thru the tarsal conjunctiva about the posterior margin of the tarsus close to the external canthus. This thread is made into a loop by which the position of the parts is easily controlled by the left hand, which can still be used to hold the forceps for the ablation of the gland.

**LACRIMAL DRAINAGE.**—After careful and exhaustive study of the mechanism of the drainage of tears with special reference to the results of modern tear sac operations, **Friberg** is of the opinion that there is some hindrance to the regurgitation of tears especially at the sac end of the canaliculi. There seems to be no absolute evidence that there is any sphincter action around the puncta. The theories that explain the exit of tears can be classified in two groups. The flow is dependent upon the movement of the lids or it is not. In the latter group there are three theories: Tears flow into the nose by siphon action, by capillary attraction, or by aspiration from the nose. None of these mechanisms account for the known facts.

The movement of the lids can act by compressing or dilating the sac or by squeezing the canaliculi. After **West's** and **Toti's** operations the tears pass normally into the sac, so we are bound to conclude that even if we admit some alteration in the shape of the sac, the canaliculi alone are able to drive the tears into the nose. There is no proof that blinking either dilates or compresses the sac. The canaliculi, normally are held open by the elastic fibers that surround them, and by the tonus of the surrounding muscular fibers. During lid closure they are compressed against the caruncle and the fluid they contain is forced into the nose.

The author, after a **West** operation, succeeded in proving that fluid is expressed during lid closure. He made a funnel of rubber which he attached to a U tube. The funnel was pressed against the nasal opening made in the operation, and then each time the lid

closed the fluid rose in the U tube till it stood several millimeters above the level of the eye.

**ABSCESS OF CANALICULUS.**—**Tooker** reported an interesting case of localized suppuration of a canaliculus. A man aged 88, complained of a painful swelling in the upper lid of the right eye at the angle of the nose. Examination revealed the presence of chronic trachoma in the lids of both eyes; and in the upper lid of the right eye an abscess of the canaliculus, with drainage neither into the lacrimal sac nor the conjunctival sac. The swelling was about the size of a bean, and on being opened a cheesy purulent liquid escaped. He thinks that the canaliculus became occluded at both narrowed orifices, externally and internally, following an extension of the trachomatous processes from the conjunctiva. The occluded passage then probably became infected and an abscess resulted.

**LACRIMAL STENOSIS IN INFANTS.**—**Roy** in his article on lacrimal stenosis in infants and its treatment, defines this condition, as those cases which present excessive tearing in the conjunctival sac, or flowing out upon the cheek, and some catarrh of the palpebral conjunctiva. He gives the following groups:

(1) Stenosis due to congenital malformations, as absence of the puncta, or closed with a membrane.

(2) Stenosis due to spasmodic contraction in some portion of the passages.

(3) Stenosis the result of a catarrhal thickening of the mucous membrane at some point in the lacrimal passages.

Treatment can be summed up as follows: Expression of the contents of the sac, mild antiseptic in the eye, treatment of nasal conditions, occasionally probing and washing out the tear passages. Most of these cases get well without any treatment. Roy asked Knapp, Gruening, Cheatham, Burnett, Alt, de Schweinitz and Theobald if they had ever seen a case of spasmodic stenosis; all replied in the negative.

**Green** thinks that infantile dacryocystitis, in the majority of cases, is the result of blockage of the lower end of

the nasal duct by fetal remains, and considers the rational treatment is to probe the canal, after expression and lavage have failed. He also thought a flexible probe might be an advantage.

**Curdy** thought that since the pneumococcus is the microorganism infecting the closed passage, there is danger to the cornea in waiting too long, before resorting to the probe.

**INFECTION OF THE LACRIMAL CANAL.**—Such infection in war ophthalmology is the subject of a paper by **Grelault**. Infection of the lacrimal canal, he thinks constitutes a danger to the vitality of the eye in wounds of the latter. Infection may be said to exist whenever the drainage of the lacrimal duct is imperfect. The signs of imperfect drainage are:

(1) When by pressure of the sac there is an exudate of mucus, or a muco-purulent or purulent fluid from the puncta.

(2) The presence of a swelling, a liquid tumor on the inner side and below the internal commissure. This dilation shows that the walls have lost their elasticity and that the sac is incapable of emptying itself.

(3) Investigation of the patency of the lacrimal canals by an injection made thru one of the lacrimal points.

(4) Investigation of the physiologic capillary permeability. This should be done by the aid of a weak collyrium of argyrol or methylene blue. The patient blows his nose to clear the middle meatus of mucus. Each nostril is occluded with a plug of cotton. The subject's head is slightly inclined forward to prevent the passage of the fluid into the rear cavities. In presence of normal permeability the colored liquid stains the upper surface of the cotton.

In a subject who presents none of these signs, the lacrimal canals may safely be regarded as healthy.

**Therapeutic Conclusions:** (1) Radical cure by extirpation or igneous destruction except when men are at the front, this constitutes prophylaxis in view of subsequent wound of the eye.

(To be continued)



# DIGEST OF THE LITERATURE.

## THE LACRIMAL APPARATUS.

JOHN A. McCaw, M. D., OPH. D.

DENVER, COLORADO.

*(Continued from September issue)*

(2) In case of wounds of the globe or the cornea and in presence of infection in the lacrimal glands, a radical cure must be done by means of igneous sterilization. Should the case run on to panophthalmia or ulcer, radical cure of the sac is still indicated.

Black reported a case of double dacryocystitis of many years' duration in a man 49 years of age. The man had central leucomas in both eyes from infection following slight corneal injuries. After an unsuccessful iridectomy upon his right eye, the patient came to Black with this eye quite irritable. He enucleated the right eye, and performed a dacryocystorhinostomy on the left tear passages. In a short time drainage stopped, probably due to some injury to the upper end of the sac, then he destroyed the sac with trichloracetic acid, to eliminate infection, when an iridectomy was done on the left eye.

Von Szily investigated the normal and pathologic conditions of the lacrimal passages by means of roentgenographs. Two principal types constantly recur. In the first group the changes start from the so-called isthmus ductus lacrimalis. Beneath the sac with a comparatively broad duct a contraction takes place which later becomes complete. In another large portion of cases there is a gradually progressive disease and contraction of the duct from below. In both cases large ectasias and diverticuli of the sac may appear as time goes on, of which the roentgenograph first gives us a correct conception. He showed also pictures of tuberculosis of the lacrimal passages, of valvular occlusion in which abundant residual contents always re-

main after the tensely filled sac has been emptied by pressure, of acromegaly, of congenital atresia of the nasal opening, and of battle wounds of the lacrimal passages.

TREATMENT OF LACRIMONASAL OBSTRUCTION.—Gleason considers the small size of the puncta and the pressure of the valve of Hasner protection against infection either from the eye or the nasal mucous membrane. The nasal orifice of the duct is in the suture of the inferior turbinate with the superior maxillary, at the junction of the anterior fourth with the posterior three-fourths of the turbinate at the apex of a broad inverted V, the line of suture descending somewhat abruptly in front and more nearly horizontal behind; so that the valve of Hasner is easily located by passing a probe from behind forward beneath the inferior turbinate until the end of the probe sinks into the apex of the V described above. The nasal orifice of the duct can be inspected in most instances by infracturing the inferior turbinate with Sullivan's modification of Killian's speculum.

Generally the obstruction to the flow of tears is either where the inferior canaliculus enters the sac or at the nasal orifice of the duct. If the obstruction is at the canaliculus, the treatment is astringent collyria, dilation, or slitting open the canaliculus. When the obstruction is at the nasal orifice of the duct, treatment should be directed to reducing the size of the inferior turbinate, or changing its relation to the nasal wall by infracting it towards the septum.

Dr. Posey, in discussion, said that the cause of a watery eye is not always

intranasal, for it may depend upon a number of factors connected with the eye. Thus, increase of lacrimation is symptomatic of nearly all inflammatory conditions of the eye; certain conformations of the skull which occasion abnormally small lacrimonasal ducts predispose to it. Anything which interferes with the delicate suction like action by which the tears are sucked up from the globe, and conveyed into the lacrimonasal sac, is also a causal factor. Certain innervational disturbances in the supply of the orbicular muscle, and relaxation of the internal palpebral ligament will occasion this.

Posey's plan of procedure in the treatment of diseases of the excretory portion of the lacrimal apparatus is as follows: If there is simply increased lacrimation without any apparent local cause to occasion it, the punctum is dilated and the sac and duct washed out with a solution of boracic acid, zinc or alum. If repeated syringing fails he then introduces a style, care being taken that the length of the style conforms to the length of the duct. The style is removed at the end of three or four months.

For acute dacryocystitis after administration of a general anesthetic, the lower canaliculus is emptied by pressure on the swollen lid and a style inserted. For lacrimal stricture with catarrhal discharge: Syringing with astrigent washes and instillation of a 1 or 2 per cent solution of ethylhydrocuprein into the conjunctival sac several times daily. Failure after two or three weeks of this treatment is followed by extirpation of the sac. For mucocele of the sac, extirpation is advised in all cases. For extirpation of the sac the method of Meller is followed closely.

Holloway has had good results in using mercuraphen as an irrigating fluid.

Nagano reports prompt cessation of discharge after use of pyoktanin in dacryocystitis, and **Figueras Pares** reports his method of treating chronic dacryocystitis without resort to extirpation of the lacrimal sac.

**THREAD DRAINAGE FOR CHRONIC DACRYOCYSTITIS.**—**Pond** uses a long silver probe with one end blunt, and the other, having an eyelet large enough to carry a large silk suture, is threaded and passed thru the canal into the nose, where the end is grasped by a pair of forceps and drawn out thru the nostril. The probe is then unthreaded and the silk left in this position with the ends tied together. The silk is worn about a week, being drawn thru the nose 2 or 3 times a day. The canaliculus is slit and the operation is done usually under local anesthesia but occasionally he uses ether. He washes the canal daily with 10 per cent iodine. The string is protected by a piece of gauze and adhesive plaster.

**WINDOW RESECTION.**—**Chamberlin** modifies the West operation, as described by himself. A probe is inserted into the canaliculus, sac and duct. This probe is held in place by an assistant. When the duct is freely uncovered the point of the probe is directed inward towards the septum, thus bulging in its septal wall. A thin scalpel is now inserted between the probe and the lateral nasal wall, and the incision carried well up beyond the isthmus, so that the probe ultimately passes horizontally into the nose.

Mosher, in discussion, reported four cases that he had operated on. Three of them were of two years' duration. One case was of mucocele of the sac. After nine months there was no return or swelling of the sac and the opening into the nose is patent. The second was one of long standing, a suppurative sac, with a skin fistula. The eye is all right and the tears run over only when the patient gets cold. A third patient had a suppurative sac for seventeen years complicated with an infected mucocele of the ethmoid labyrinth. There is now a patent opening into the nose and the tears run over only on a cold day, or in a strong wind. The fourth patient had a bony occlusion of the nasal duct. This man is wearing a style at the end of ten months, and with it there is no running over of tears except in a strong wind.



**Good** reported a case of double dacryocystitis. On one side he performed the Yankauer operation with success. He preferred the Yankauer operation to the West, since Yankauer pointed out that frequently it is the bony wall around the duct down below that makes pressure upon it. And if this bony wall is removed, the natural opening is reestablished.

**DACRYOCYSTORHINOSTOMY.**—**Kyle** referred to an article published by him in the *AMERICAN JOURNAL OF OPHTHALMOLOGY*, 1897, in which he described practically Toti's operation. Hirschberg, of Berlin, in commenting on Kyle's operation in his book on diseases of the eye, said that the operation as described by Kyle was known for more than 1,300 years, and was a rediscovery.

In his modification of Toti's operation, **Wiener** uses local anesthesia. If the sac is found closely adherent, it is better to make an incision into the sac from above downwards, just where the anterior wall is reflected on to the bone. With curette or dissection he cleans off this layer of mucoperiosteum from the lacrimal fossa and gets a clean picture of the bone cavity. A trephine of 4 mm. in diameter is placed as low down in the lacrimal fossa as possible, and a button of bone removed. The opening in the bone is enlarged to 6 mm. by 10 mm. by a small conchotome.

If possible a flap of the nasal mucous membrane, quadrilateral in shape, is cut base down, and reflected back into the sac and the packing adjusted. He uses selvage-edged iodoform gauze

half inch, saturated in vaseline, for the packing. The upper suture is long enough to permit the withdrawal of the pack for renewal. The anterior cut edge of the sac is stitched with chromic gut to the periosteum of the anterior edge of the opening and the skin wound is closed.

**EXCISION OF LACRIMAL SAC.**—**Kirkpatrick** reports 214 cases of excision of the sac for the year 1916, at the government ophthalmic hospital in Madras. He simplifies the operation by disregarding the preservation of the palpebral ligament. This, it has been found, produces no disfigurement.

**Stapleton** reported six cases of chronic dacryocystitis. He extirpated the sac by the Meller method from all of them with uniform results. **Garcia del Mazo** treats dacryocystitis with extirpation of the sac. **Thompson** cocaineizes the canal and passes a small flexible curette and cures all parts of the canal, and removes the granulations. Next he performs a dacryocystorhinostomy and with twisted gauze rubs the sac and the lacrimal duct.

**MISCELLANEOUS CONDITIONS.**—**Crisp** reported a case of *abscess of the caruncle* in a woman 21 years of age. The abscess was preceded by an attack of conjunctivitis. The process was repeated in the other eye four months after the first attack. **Fava** reports rare affections of the lacrimal apparatus.

**Utsida** described a skin *papilloma* appearing from the mouth of an open tear sac wound. He believed that it was due to the secretory irritation of the skin that was rolled in, similar to the formation of a condyloma.

## DISEASES OF THE LIDS.

FLORENCE MAYO SCHNEIDEMAN, M. D.

PHILADELPHIA.

This section reviews the literature from January, 1917, to July, 1918. Related topics are considered in the sections on Conjunctiva, Orbit, Tumors, and Injuries.

**ANOMALIES.**—**Posey** reports a case of bilateral *coloboma* of the lower lids. The notch in the right eyelid was situated at the junction of the middle and

outer thirds, that in the left at the junction of the middle and inner thirds. Both superior maxillary bones showed faulty development, in consequence of

which the right side of the mouth was drawn markedly upward. The inner halves of both upper lids exhibited colobomatous tendencies, the margins in this position being drawn upward in a sweeping curve with its convexity downward. The fissure in the right lid had been corrected by a plastic operation as also the deformity at the angle of the mouth; the latter operation by Dr. John B. Roberts. The coloboma in the left lid, which was complicated by symblepharon and marked retraction of the tissues of that region, had resisted correction at the first operation. Dr. Posey said he had another procedure in mind which aimed at correction of the deformity by transplantation of a flap of skin from the root of the nose into the colobomatous area.

**Van der Hoeve** reports three cases of congenital *ankyloblepharon* in which, beneath the adherent margin of the lids, the plica semilunaris was normal, but the caruncle much enlarged and firmly attached to the inner surface of the lids. The lower lacrimal puncta had an anomalous position. They were so far from the normal one, that they did not dip into the lacrimal lake, but lay in front of the cornea.

**ANOMALOUS ASSOCIATED MOVEMENTS.**—In the case reported by **Demaria** and **Caldora** in which, during rest, a slight ptosis existed of the right eye, this anomaly disappeared and even left exposed a part of the sclera above the cornea, when the inferior maxilla was drawn downward in mastication. The elevation of the upper lid attained its maximum when the jaw was moved laterally in the direction opposite that of the affected eye. The other ocular muscles were normal tho the pupil was larger than that of the other eye. The most general opinion of the cause of this condition is that the nucleus of the oculomotor is congenitally related to the trigeminus and even the facial. **Lutz**, however, opposes this view and thinks that the anomaly must be referred to the subcortical center. On the ground of the anisocoria observed in their case, the reporters believe that the cause must reside in the cortical centers, near the lower part of

the frontal convolutions, which are probably connected by Meynert's U fibers.

In **Holloway's** case of a woman aged 44, there was a history of distinct drooping and retraction of the right lid at times, or as the patient expressed it, "she winked when she ate." This was first noted by her mother when she was a nursing infant. While the palpebral fissure measured  $9\frac{1}{2}$  mm., she stated that at times the right upper lid drooped. The eyes fixed well in various positions, except above the horizontal plane, when the right eye diverged. There was a suggestion of lagging in the upward rotation of the right eye. Upon looking downward the right upper lid failed to follow the globe to the same extent as the left upper lid. Upon attempts at chewing, there was retraction upward of the left upper lid, accentuated upon labial movements of the jaw. This retraction was excessively marked when the patient looked down; and but slight when she looked upward. The diplopia fields indicated paresis of the right superior rectus. The eyes were otherwise normal.

In **Kleinhans's** case with complete congenital ptosis of the right lid, upon opening the mouth the lid shot up. Lateral movements of the jaw had no effect upon the lid. There was insufficiency of the right superior and internal recti, no fundus changes, and vision in each eye was normal.

**Menacho** observed retraction of the upper lid associated with lowering of the lower jaw, but not with its lateral movements, as in most of the cases published, in a healthy young woman presenting simply a slight enlargement of the thyroid, without any of the other symptoms of Graves' disease; the association was first noticed when the patient was 12 years of age. How may we explain the connection between the third and fifth nerves, in this case, acquired and not congenital? The writer believes an exclusively anatomic explanation of this phenomenon to be unjustified. He argues that a close relationship exists between the functions of the cranial nerves—a relation which



may be attributed to connections situated at the nuclei of origin, between the subcortical centers, or in the cortex itself. These paths of communication, regarding whose precise course physiology and anatomy have still something to clear up, may be functionally interfered with, either by inhibition or irritation; this hypothesis explains provisionally the phenomena presented by this case. A purely anatomic hypothesis would be quite justifiable if the condition had been congenital but meets with an insuperable objection where it is acquired.

In **Schirmer's** case a healthy man aged 28 years developed a left sided facial paralysis seven months ago; after four months, slow but continuous improvement began. Today recovery is perfect except for a slight weakness of all the muscles innervated by the seventh nerve. For more than three months, every movement of the left cheek, in laughing and chewing, is accompanied by partial closure of the left eyelids. Spontaneous contractions of the left orbicularis are not present. The reporter thinks that these associated movements are due to the fact; that from the central stump of the facial nerve, fibers which were meant for the muscles of the cheek have grown into the orbicularis muscle. Every intended movement of the cheek will therefore be accompanied by contraction of the lid muscle. This explanation was first given by Lipschitz.

**Gonne** observed a case which he considers to be an instance which has hitherto been described in the Italian literature alone under the title "Ptosi Bilancia"—Balance Ptosis. The patient was an adult male the subject of lues, who developed ptosis of the left eye, and the left eyeball showed a slight divergent strabismus. The inward rotation of this eyeball was impaired, but other extraocular movements of both eyes were normal. The right pupil reacted promptly to light, the left sluggishly. *When he closed the right eye, the left upper lid raised without effort, and the eye was opened to almost the full extent.* With the right eye opened the left could not be raised at all. There

was no facial palsy or asymmetry, and the tongue was protruded straight and showed no atrophy.

There were a number of other neurologic symptoms of syphilis of the nervous system, a positive Wassermann reaction in the spinal fluid. Well marked disseminated choroiditis, probably specific, was also present. The case evidently showed incomplete paralysis of the left third cranial nerve, manifesting itself as balance ptosis. It is quite similar to the case of "Ptosi Bilancia" reported by Artum in *Il Policlinico Practica*, 1913, in which the diagnosis of syphilitic basilar meningitis was made. The same symptom was reported by Pacetti in three cases of tabes and taboparesis. In none of these cases was the spinal fluid examined.

This peculiar type of ptosis may be looked upon as a sign of syphilis of the central nervous system. It might be thought to be due to the reflex action on the part of the patient to prevent diplopia, but one objection to this view is that in a reflex closure of the eye, there is spasm of the orbicularis palpebrarum, which is not supplied by the third nerve, but by the facial. There was no indication of facial spasm in this case. Another objection is that although diplopia is common, a balance ptosis is extremely rare.

In the discussion of this paper, Clay advanced the plausible explanation, that the paretic left lid could be raised when the right eye was closed by reason of an increase of nerve supply to the partially paralyzed levator. This was the original explanation also of Pacetti, tho this hypothesis involves a theory of the relations of the oculomotor nuclei which is not altogether clear, as observed by Camp in the course of the same discussion.

**PROSIS.**—**Posey** observed in an infant congenital ptosis and lack of upward rotation of the eyes, with marked dilatation of the veins in the skin of the upper lids. There were no vascular changes elsewhere about the eyes and nothing in the history which gave a clue to the origin of the venous swelling.

In **Spencer's** case of a man aged 27, there was a history of ptosis since 15 or 16 years of age; but which has been much worse for the past three years. The mother, maternal grandmother, two maternal aunts, and one brother all had a similar condition. There was compound myopic astigmatism in both eyes, correction of which gave satisfactory vision. The anterior segments and fundi are negative. The subject usually fixes with the right eye, the left eye is often divergent 10 or 15 degrees, which divergence was found to be alternating. Abduction, adduction, super- and subversion are all very limited, as is also convergence. Neither eyelid can be raised without the assistance of the frontalis muscle. The reporter believes this to be a case of bilateral congenital absence of the superior rectus and levator of the upper lid. He performed a Tansley-Hunt operation upon each upper lid with slight over correction.

A new operation for ptosis has been proposed by **Maddox**. Like Bowman's operation it approaches the tissues by double eversion of the lid with an especial forceps. It is particularly suited to cases of acquired ptosis, and may be supplemented by anterior operations. It has been described in detail, *A. J. O.*, v. 1, p. 52.

**MARGINAL BLEPHARITIS.** **Cuénod** divides this disease into the simple and ulcerated forms. The former is due to chronic hyperemia of the lid margin, frequently of diathetic origin. It often occurs in subjects exposed to frequent irritation of the conjunctiva, or from ametropia, obstruction of lacrimal passages or vitiated atmosphere. There is hypersecretion from the Meibomian glands and the glands of Moll. The ulcerated form is due to a folliculitis from staphylococci.

The treatment consists of: (1) Combating the atony of the tissues; (2) Preventing general autointoxication, usually from the alimentary canal; (3) removal of all local causes of irritation; (4) Efforts to secure vasoconstriction of the vessels; (5) combating the staphylococcic infection. As a vasoconstrictor, the author

advises adrenalin, followed by cold compresses. When the staphylococci have penetrated deeply into the follicles, applications of yellow oxide fail to reach them. In this condition, the writer epilates the entire ciliary margin under cocain, and then applies a solution of iodid in acetone, followed by a glycerin dressing for 24 hours. In case of recurrences he advises anti-staphylococcic vaccine.

**Unna** calls attention to the stubbornness of ciliary blepharitis under the treatment usually employed, namely, Pagenstecher's ointment. He claims to have been always successful with the following method. He combines two processes for two different ends; one, a simple treatment of the palpebral inflammation and of the neighboring conjunctiva, and the other an active measure which penetrates into the depths of each hair follicle. The first treatment, an ointment, is uninterruptedly applied by the patient, the second from time to time, by the physician. The following ointment: Pyraloxin 0.1 to 5 gr., Borax water (3%) 10 gr., Solution of suprarenin 1 gr., Eucerin anhydr. ad 50 gr. is to be applied several times daily by the patient. It has rendered great service, not only in all eczemata of the lids, but also for reducing inflammatory conditions of the lid margin and conjunctiva. Under its influence the scales are easily detached, and then it suffices that the physician touches, every other day, the follicular canals, which are uncovered, with a small tampon moistened with silver nitrat 5 gr., water 10 gr., and sp. ether nitrous 85 gr. This alcoholized fluid penetrates sufficiently deep into the follicle; and the silver nitrat is not reduced in this weaker solution as it is in the common alcoholic solutions.

**ECZEMA.**—In a witty article, with pithy references from Don Quixote, Shakespeare, Rabelais, Guy de Maupassant, and an epilogue to John the Baptist, with an excursion into the ancient doctrine of the four humors, **Montgomery** discourses very pleasantly upon the subject of seborrhea and the effect of that condition in opening the breach to the attack of bacteria;



with especial reference to other mal-  
eficent influence upon the edges of the  
eyelids (*Blepharitis marginalis*), giv-  
ing to the complexion that Swiss  
cheese effect combined with chamois  
leather. The article is really an in-  
structive one and loses nothing from  
its pleasantry.

The same writer reviews the more  
usual remedies for eczema of the eye-  
lids. For *blepharitis marginalis* he  
discusses the ointments of both the yel-  
low and the red oxides of mercury, and  
the probable mode of action of these  
oxides—namely: the oxygen being  
very loosely held (*Priestley* in fact ob-  
tained the oxygen which he discovered  
in 1774 from  $\text{Hg.O.}$ ) is displaced by  
the chlorin of the sodium chlorid of  
the warm alkaline tissue juices and  
tears, forming nascent  $\text{Hg.Cl}_2$ ; which  
in turn unites with the albumin pres-  
ent and is swept away. This nascent  
bichlorid of mercury therefore forms  
an effective and, to the tissues, innocu-  
ous antiseptic. Calomel ointment 2%  
sometimes agrees better. Some of the  
metal changes into the bichlorid of  
mercury as in the former instance.  
Camphor acts soothingly and also as  
an antiseptic and 1 or 2% may be  
added advantageously to the above  
ointments.

In cases where the integument has  
an intolerance for grease, watery solu-  
tions of the cyanid or bichlorid of  
mercury (1-10000) may be advised.  
Nitrat of silver in 1 or 2% solution is  
often excellent were it not for the dis-  
coloring effect. Argyrol is less active.  
Far better than the above solutions is  
warm or hot solution of boric acid per-  
sistently applied for some time. In  
erythematous eczema great care must  
be employed in the application of any  
remedy. Some indeed assert that this  
affection will tolerate nothing but cold  
cream; but something more than this  
may be done to mitigate the asperities  
of the disease. The dephlogisticating  
effect of hot water applications may be  
also employed with excellent results.  
Something should also be added to the  
water to heighten its specific gravity  
and to render it hypertonic, as other-  
wise it would act osmotically and det-

rimentially on the congested papillary  
layer of the skin. Although it is often  
said that lead water should not be em-  
ployed in this region, the writer can  
find no clinical or scientific reason for  
this belief, but it should be very dilute.

Ointments may act badly for two  
reasons. Some skins are intolerant of  
grease, and in very active hot eczemas  
the grease may act heatingly by inter-  
fering with escape of secretions and  
radiation of heat. Pastes which are  
ointments but contain far more pow-  
der, are sometimes superior. The paste  
made of naftalan is deserving of spe-  
cial mention. Being obtained from a  
coal tar mined in southern Russia, it  
has like many other articles become  
practically unattainable since the war.  
It is of special value in acute eczema,  
as in infantile eczema. The acute der-  
matitis of the eyelid, so frequently ob-  
served in poison oak (*primula*) poison-  
ing, and in hair dyes (paraphenalin di-  
amin) receive the same local treatment  
as erythematous eczema.

**GANGRENE OF THE LIDS.**—Three cases  
reported by **Soliman** were characterized  
by rapid swelling of the lids and face,  
fever, and general disturbance; suc-  
ceeded by extensive sloughing of the  
skin, which extended to the brow, tem-  
ple, cheek, and side of the nose, and  
left severe cicatricial changes. In one  
of these cases bacteriologic examina-  
tion showed, in addition to staphylo-  
cocci, a short bacillus, which grew lux-  
uriantly in agar. Emulsions of this ba-  
cillus produced gangrene in the skin  
of the abdomen of guinea pigs, and in  
the eyelids of a horse.

**HERPES.**—In **Wilson's** case, following  
neuralgic pains over the right side of  
the forehead and extending down over  
the mastoid, a crop of vesicles appeared  
over the right brow, forehead and  
scalp, and margin of the upper lid.  
The upper and lower lids were so  
swollen that the cornea could not be  
inspected. There was great prostra-  
tion with fever, so that the disease pre-  
sented the appearance of an alarming  
infection. Crops of pin point vesicles  
also appeared upon the abdomen and  
back. The acute condition lasted about  
one week followed by a comparatively

rapid convalescence. The cornea was not involved.

Wible observed *herpes zoster ophthalmicus* in a man aged 51 years. The patient had been treated by his physician for 16 days for supposed erysipelas. The vesicles were on the right side; extending from 2 inches within the midfrontal hair line to the tip of the nose, and of a width of space varying from 1 to 2 inches. The cornea and conjunctiva were involved, causing profuse lachrimation and intense photophobia. Severe burning and itching pain where the skin was involved was complained of. The nerve supply to the infected region included the frontal, lacrimal and nasal branches of the ophthalmic division of the fifth nerve.

The treatment consisted of quinin and acetanilid, the latter to alleviate pain. Carbolic acid ointment was applied locally to the skin, cold compresses to the eye, and atropin instillations. This treatment gave reasonable comfort. Thirty days after the attack, the herpes had almost healed, leaving deep pits resembling those of smallpox. The pupil, at first irregularly dilated, has become circular. The cornea presents a number of small opacities. The conjunctiva, both ocular and palpebral, is still angry and swollen. This is the fourth case seen by the reporter in about 20,000 private and hospital cases.

Morax reports two cases of herpes consecutive to *antityphoid inoculation*. In the first case, a slight eruption of herpes on the lower lid followed a second injection, accompanied by slight fever. A third injection, one week later, was followed by rigors and marked increase of temperature. A few days later herpes appeared on the lips and nostril and behind the right ear. Five days subsequently the right eye showed a typical attack of herpetic keratitis. The author also refers to the following three cases of ocular lesions following antityphoid inoculation, but he regards these as coincidences: (1) Paramacular retinal hemorrhage; (2) paralysis of both external recti, associated with generalized paralysis; (3) optic neuritis due to in-

tracranial neoplasm. These four cases were the only instances of ocular lesion observed among 1,700 inoculated soldiers whom he examined. The writer records another case of herpes following a fourth antityphoid inoculation. The eruption had occurred upon the face, eyelids, and cornea.

Gloagen observed three cases of palpebro-ocular herpes following *antityphoid vaccination*. In the first case, the first two injections presented nothing of special note; the third was followed by fever, headache and pain in the back, on account of which latter symptom lumbar puncture was performed. The same day (i. e. the day following the injection) an outbreak of naso-labial herpes, especially intense upon the right side, occurred. Three days later the right eye became congested with photophobia; but the patient was not referred to the ophthalmic clinic until three days after this. At that time the reporter noted typical herpetic keratitis, the delicate ramifications of which could be seen by means of fluorescein. Recovery took place at the end of 18 days; leaving, however, a fine corneal opacity which lowered the visual acuity to 0.6.

In the second case, three injections were made without reaction; the fourth was followed by fever and headache. The following morning an extensive naso-labial outbreak of herpes appeared, especially upon the right side; four days later the reporter observed in addition to the palpebral eruption, a typical herpetic keratitis involving almost the entire cornea. Recovery took place at the end of 25 days, with persistence of a slight opacity which reduced the visual acuity to 0.2.

In the third case the same constitutional symptoms followed a first injection. The same night an eruption of naso-labial herpes took place and the next morning there was photophobia of the left eye. Upon admission to the hospital three days later, the reporter observed patches of herpes disseminated upon both lids of the left eye. The cornea was completely covered. Recovery was slow, requiring 43 days. Vision reduced to 0.1. Thus ophthal-



mic herpes was observed following the first injection in the third case, the third injection in the first, and the fourth injection in the second.

**SYPHILIS.**—In **Pisarello's** case of hereditary lues, in a man of 22 both lids of the right eye were greatly swollen; and a large and deep ulcer occupied the region of the internal angle and the inner third of the upper, and two-thirds of the lower lid. The edges were sharply cut, raised, and the base covered by a grayish membrane which was readily removable. The eye was unaffected and vision normal. The submaxillary, preauricular, and cervical glands were painlessly enlarged. Microscopic examinations from the scrapings of the ulcer showed neither tubercle bacilli nor spirochetes. Intradermal tubercle reaction negative. Wassermann strongly positive. Intensive treatment with mercury and iodid resulted in a cure.

**Kitamura** observed in a 17 year old Chinaman a syphilitic process, which began at the tip of the nose and spread over the entire left half of the face, destroying both lids and the eyeball.

**TUBERCULOSIS.**—In **Hughes's** case a small growth had been removed from beneath the upper lid, which was found to be a tuberculoma. Upon eversion of the lid, there were a number of soft dark red papules, that gave the typical "apple jelly" nodular appearance first described by Jonathan Hutchinson. At the center of the lid was a furrow where the old tuberculoma had been

removed. There was swelling and hyperemia of the conjunctiva and some drooping of the lid. A corneal ulcer was present with considerable bulging of the cornea. There were a number of enlarged broken down glands of the neck, and a discharging sinus of the ear. A family history of tuberculosis was elicited; repeated Wassermann tests were negative.

**Chance** writes a paper upon *Lupus Vulgaris*. When lupus of the face has lasted for a long time, it may invade the eyelids and the globe, with disastrous effects, even to blindness. But more commonly when the disease encroaches upon the eye, the cicatricial formations may only distort the eyelid, and cause moderate or even severe ectropion. The infection may pass from the nose thru the lacrimal passages to the conjunctiva, or in the reverse direction. The process may pass from the lids to their conjunctival surfaces; and extend even to the eyeball itself, which may become seriously affected. Tuberculosis and lupus of the conjunctiva should, according to Fuchs, be regarded as essentially identical affections.

Lupus ulcers of the conjunctiva can be distinguished from tuberculous ulcers by the fact that they have migrated from the skin; and that like lupus of the skin, they cicatrize spontaneously on one side, while on the other, the ulcer keeps advancing. When the disease invades the mucous membrane of the eye, treatment consists in the rad-

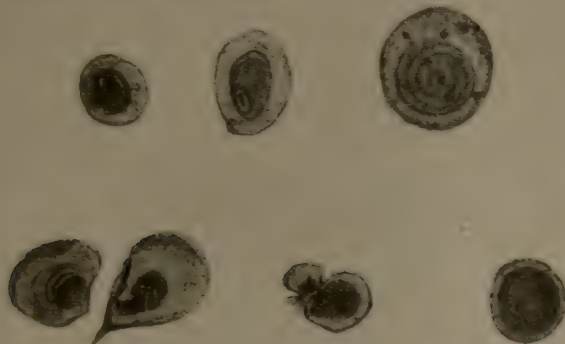


Fig. 1. Diagrammatic representation of the organism found by Del Monte. Each contains a nuclear stained portion in the center, surrounded by unstained substance with scattered granules. In the lower row are shown dividing forms and one that seems cystic. See page 170.

ical excision or curettement of the ulcers; and the cauterization of the raw surface, great care being taken not to damage the cornea. When the area is so extensive that complete removal is likely to be followed by symblepharon, or other deformity, reliance may have to be placed solely upon tuberculin. The after treatment consists in the long continued use of powdered iodoform.

tozoa, where the granulomata are seen to be rich in giant cells in which the parasites are almost invariably enclosed. The author summarizes the process which terminates in the formation of a chalazion as follows: Hydration, edema and decomposition of a definite extent of tissue, (meibomian epithelium in the primary or initial stage, tarsal in the secondary or stage of diffusion). Proliferative reaction and



Fig. 2. Morax operation for total symblepharon. See page 171. Skin flap dissected up, and free from edge attached to skin at upper and lower margins of socket. Left in vertical section. Right as viewed from the front. L S upper flap. L I lower flap, F raw surface.

**CHALAZION.**—**Del Monte** claims to have discovered a protozoon which he considers to be the cause of chalazion. He bases his conclusions upon the following data: 1, Constancy of the parasite in all recent cases, or such as are still in process of evolution. 2, Characteristic form and structure, for exemplification see diagrams, Fig. 1, p. 169. 3, Localization at the points where the morbid process is still active; absence where the latter is completed or has never existed. 4, Evident irritating effect upon the tissue, constant presence of giant cells about the bodies in question. 5, Presence at the center of infiltration granules, in accordance with the general law that the cause of a granuloma is always localized at the center of the granulation. 6, Behavior analogous to that of other known pro-

formation of a granulomatous nodule, the center of which is made up of the remains of decomposed tissue. As concerns the mode of action of the parasite a primary lesion is produced; i. e. a kind of microbiosis or toxic histolysis, which is followed by proliferative inflammatory reaction.

To control pain and subsequent hemorrhages in the removal of chalazion **Bernstein** makes use of the Freer method of anesthesia and blood control employed in nasal surgery. A cotton tipped probe is dipped into the stock solution of epinephrin, and a few flakes of pure cocain picked up. This is rubbed into the conjunctiva over the mass, and a short distance beyond. At the expiration of two minutes, the area is again rubbed with the same probe and solution. In another two minutes



anesthesia and blanching is complete. After making the cut into the conjunctiva, he makes use of Meierhof's tympanum curet to remove the sac. This curet differs from the ordinary type in that its edges are serrated, and thoroughly remove the whole sac with the least damage.

**SYMBLEPHARON.** — **Morax** observes that whereas partial symblepharon can generally be managed readily, such is not the case in total symblepharon with complete abolition of the conjunctival sac. The formation of a new cavity for prothesis is a most difficult problem. The tendency to retraction and contraction of the orbital tissues is such that the most extensive and perfect graft suffers retraction, such that the new cavity decreases greatly and may even disappear almost entirely. To obviate this tendency, the author has devised a procedure which consists essentially in the formation of two wide "trap doors," the raw surfaces of which are turned outwards above and below by suturing their edges to the skin after freshening the latter. Wide epidermal grafts from the arm, thigh, or abdominal wall are then applied to the raw surfaces.

At the end of three weeks the "trap doors" are replaced and sutured together at their free margins after freshening. A shell of lead or enamel is placed and allowed to remain between the doors, the bottom of the cavity being now covered with the graft. At the expiration of from six weeks to three months, the palpebral margins are cut and prothesis is possible. Several illustrations show the conditions before and after operation. The accompanying diagrams assist in making clear the descriptions. The same procedure is applicable where the orbital cavity is still occupied by a globe or stump. See Fig. 2, p. 170.

In a case of symblepharon following the entrance of mortar into the eye, observed by **Wallace**, the formation involved the inner half of the lower cul-de-sac, graduated in width up and out; and extended to and involved four-fifths of the pupillary area. The growth is thought to be progressive,

involving more of the pupillary area at present than 3 or 4 years ago. [See also p. 43.]

**ELEPHANTIASIS.** — **Katana** observed, following a blow, a red swelling upon the upper lid which later involved the lower also. The skin was much thickened and felt elastic. Histologically, a thick tissue was found infiltrated into

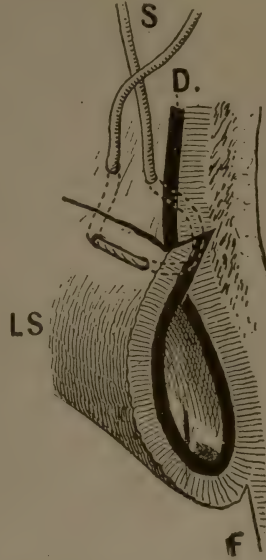


Fig. 3. Morax method of placing sutures to secure firm union of edge of flap. S suture; D epidermis; LS skin flap; F raw surface left at bottom of socket.

the blood vessels; in which tissue groups of lymph and plasma cells were noticed, especially around the blood vessels and enlarged lymph vessels; the latter were filled with lymph cells.

**TRICHIASIS.** — In a case of trichiasis of long duration, in trachoma, **Pattee**, in addition to the regular Hotz-Anagnostakis operation, split the lid margin and placed in the intermarginal groove, a skin graft from behind the ear. The result was quite satisfactory.

**ECTROPION.** — In **Schwenk's** case traumatic laceration of the brow was followed by cicatricial ectropion. The outer half of the upper lid and outer canthus were drawn up and out, exposing the outer half of the globe and tarsal conjunctiva. The first step in the operation consisted in freeing the mar-

gin of the lid from the brow. The flap should be about one-third larger than the exposed area to allow for shrinkage. The pediculated flap was taken directly from the outer canthus. The denuded portion, from which the flap was taken, was covered by undermining the skin and uniting the edges with sutures; this left a small triangle of new surface; which was filled up by a triangular flap from just below the outer canthus, and placed in the exposed triangle to prevent the canthus from being dragged out of its normal position. The last exposed patch was readily covered by two sutures. A bichlorid vaselin compress was applied as a dressing; this was not disturbed for three or four days to avoid disturbing the flaps.

The **Whites** describe the various forms and pathology of ectropion. They comment upon the unsatisfactory nature of the usual operations where the ectropion is marked, especially if due to trachoma. For advanced cases they have instituted and performed for many years with success the following operation: The eyelid is stretched and if possible the junction of the ocular and palpebral conjunctiva is found; and an incision, the entire length of the lid is made, that is from the inner to the outer canthus. This incision is carried thru the conjunctiva and the tarsus. It is always necessary to include the cicatricial line in the incision. This boatlike shaped piece of cartilage and conjunctiva is removed, leaving a deep space. Three double needle sutures are introduced into the ocular conjunctiva flap or end; and also into the strip of cartilage, if it is left at the discretion of the operator, equally distant from each other. The flat strip of cartilage is then pulled down into the above space, and the sutures are continued at the bottom of this space thru the tissues and tied on the cheek. This inverts the lid and the ectropion is corrected. The palpebral end of the conjunctiva granulates in the new trough of the lid. It can be sutured, if necessary, to the other end of the ocular conjunctiva before the other sutures are introduced.

In **Allport's** case, following a railroad accident, there was a depressed fracture of the malar bone with a very adherent cicatrix resulting in complete ectropion of the entire lower lid. A first incision was made about one-fourth of an inch below the edge of the lid, and followed the curve of the same in its entirety. The integument over the cicatrix was well loosened and undermined in all directions. At the temporal end of the incision, a very large pedicled flap was cut in an upward and backward direction in the skin of the temple. The incision of the flap was such that when it was transplanted below the eye, the lines of the flap and the lower skin incision would correspond. The result was perfect approximation of the lower lid to the globe without much shrinkage. After interrupted suturing was completed, the underlying tissues were freed of all serum by rolling over the lines of suture a bit of roll gauze. By firm "rolling" a considerable amount of serum is expressed, which otherwise would be an excellent culture medium, or cause suture tension by swelling.

**Black** observed in a man, aged 25, marked eversion of each lower lid, with a similar condition of the puncta. He slit the lower puncta and made a vertical cut down each lid from the punctum. He then excised a triangle about two mm. in dimensions; this made a large punctum much easier to bring in contact with the eye ball. Ziegler's cautery punctures were made deep into the tarsal plate of each lower lid at a number of points; with the result that the lower lids rested against the eyeball in proper position, and the puncta drained the tears perfectly. The reporter emphasized the importance of a patent tear duct, if the best results are to be obtained by this method.

**ENTROPION.**—**Markel** reports satisfactory results in a case of spastic entropion of both lower lids by means of six punctures four mm. apart, and the same distance from the lid margin, with Ziegler's galvano-cautery.

**Herrenschwand** describes a case of congenital entropion of both lower lids, which at first sight seemed to be due to



chronic blepharitis, but proved to be an anomaly of development of all four lids. The anomaly was entirely due to over development of the orbicularis at the marginal portion of the lid. The tarsus was perfectly normal. The conjunctiva extended out over the edge of the lid, so that the lids appeared to have red edges. The inner edge of the margin was rounded off and the lids closed imperfectly. There were, besides, symmetric conjunctival cords of adhesion to the cornea; and the lacrimal puncta were absent. The tarsus was turned inward, not outward; the lids were shortened. Recurrence soon followed a canthoplasty; but a cure was effected thru excision of the greater part of the muscle of that part of the lid.

**PLASTIC OPERATIONS.**—To obviate the small but disfiguring notch frequently left after restoration of a divided lid margin, at the site of the wound or injury, **Duverger** has devised a method which has proved highly satisfactory. It consists in splitting the eyelid on each side of the wound and resecting a triangular area, cutaneous on one side, mucous on the other. The two raw surfaces are then superimposed and retained in position by sutures. Simple diagrams illustrate the article making the procedure readily intelligible. The author has applied the same method to senile ectropion, making a preliminary coloboma about the middle of the lower lid.

In **Lanier's** case a cut with a knife, beginning at the outer supraorbital margin 2 mm. above the canthus, severed the upper eyelid, while the blade was directed outwards; whence it was turned, making a circular incision completely destroying 2 or 3 mm. of the upper lid, and about three-eighths of an inch of the lower lid including the conjunctiva. The reporter was consulted several months after the injury, at which time a traumatic cataract dating from the injury was present. There was partial symblepharon corresponding to the denuded area around the eyelids and a fistula which extended from the outer canthus thru the lower lid and across the cheek to the nose.

The following operation was performed: The eyelid was separated from the globe, and the defects covered with vertical stretched flaps of conjunctiva, stitched into place. The fistulous sac was dissected out, and after thoro scraping and washing with mercuric chlorid, was packed into the defect caused by the loss of tissue at the outer canthus. This also was covered with conjunctiva, leaving the skin defect of both upper and lower lids uncovered. This was subsequently remedied by transplantation of a piece of skin bearing a pedicle from the neighboring tissue on the forehead, slightly larger than the defect of both lids and like it in shape. The result was entirely satisfactory.

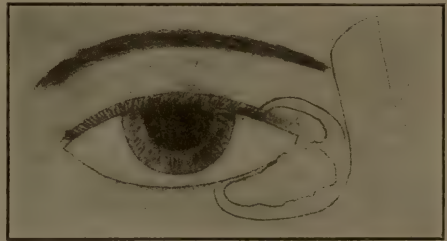


Fig. 4. Lanier's case showing lesion to be repaired and outline of flap.

**Posey** performed blepharoplasty upon a girl aged 22 years, for the restoration of the upper lid, which had been lost from orbital inflammation in childhood. The flap which was taken from the forehead included a small portion of the brow, with the view of creating a row of cilia upon the new lid. A mucous lining was provided by dissecting a small remnant of mucous

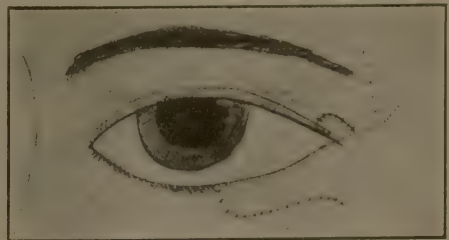


Fig. 5. Lanier's case showing flaps stitched in place and surface closed from which they were taken.

membrane which was confluent with the skin underneath the brow, reflecting it downwards, and sewing it temporarily to the lower lid. The reporter proposed removing the shrunken globe and placing a gold ball in Tenon's capsule. The artificial cilia, which would not be tolerated by a healthy eye, were intended as a cosmetic setting of an

artificial eye. He had deferred enucleation of the phthisic eye until the new lid had been properly formed, on account of the support it gave the flap.

Komoto reports good results in two cases of the Italian method of blepharoplasty. In the second case there was total ectropion, following acid burn of the face.

## DISEASES OF THE ORBIT.

HUGO W. AUFMWASSER, M. D.

DENVER.

This section covers the literature from January, 1917, to July, 1918. Related topics will be found in the sections upon Eyeball, Tumors and Injuries.

**ANATOMY.** Ochi has taken up the comparative anatomy of the orbit in certain animals. But his paper is not yet available for abstract, and may be noticed under the heading "Comparative Ophthalmology."

**EXOPHTHALMOS.**—In Hird's lecture on exophthalmos, its causes and diagnosis, the material is well classified and comprises all the essential facts. It furnishes an easily comprehensible picture of orbital affections. Jickeli's case of acute inflammatory exophthalmos set in with symptoms resembling those of influenza. The eye was proptosed 4 mm. and there was diplopia. The accessory sinuses were normal. All symptoms disappeared in a week.

Meyer-Huerlimann reports a case of Quicke's disease in a woman of 51, which was characterized by acute circumscribed swelling of the face, the ear, the leg; and probably with subperiosteal exudation not only there but also on several ribs. There was swelling of the soft palate, and of the pharynx, an acute edema of the larynx, diarrhea; and a marked exophthalmos which developed very rapidly and disappeared quickly in first one and then the other eye. Greig reported a case of exophthalmos thru convulsive movements, in a marasmic child, aged eleven months. It was noticed that when crying all the voluntary muscles, including the orbicularis palpebrarum on both sides, were

thrown into a state of convulsive movement, while in addition, the eyeballs were protruded to such an extent that extrusion appeared to be imminent.

Cross reported a case of *symmetric proptosis* of both eyes, in a man aged 53 years; coming on suddenly, first in the right eye, and a few days after the left eye also became swollen. His vision was R. 6/12, L. 6/9. The movements of the eyeballs were impaired by the swelling. The conjunctiva was congested. The cornea were clear and the ocular fundus normal. Examination of the nasal sinuses was negative. No lymphatic enlargements. X-ray examination showed the orbits to be opaque, but the nature of the opacity was obscure. The author thought it to be a form of lymphoma, a proliferation of lymphoid cells producing hyperplasia and hypertrophy of the orbital tissues, possibly due to some parasitic or other primary cause. Blood examination excluded leucocythemia and chloroma.

**PULSATING EXOPHTHALMOS.**—Cailaud reported a case of bilateral traumatic pulsating exophthalmos in a soldier aged 35 years, due to a war injury. A fragment of shrapnel entered the left maxilla, traversed the maxillary sinus and became lodged in the retropharyngeal region. Attempts at removal failed. The patient at first lost consciousness, and after regaining his senses, he noticed that he could not see



with his left eye. Two weeks later his left eye was proptosed. After several days the right eye became prominent. Examination four weeks later showed both eyes proptosed and pulsating. There was chemosis, and the lower lids were edematous. The ocular movements were limited, especially outward. On auscultation over the globe, a light blowing murmur was heard. Ulceration of the left cornea set in. Both internal carotids were ligated. The symptoms at first ameliorated, but the patient succumbed several days later from cerebral hemorrhage.

Mayou's patient, a soldier, was wounded by shrapnel entering behind the right mastoid process, and becoming lodged behind the left coronoid process of the temporal bone. When he presented himself he had a right facial paralysis with proptosis of the right eye, and pulsation could be felt by pressing the globe into the orbit. Ocular movements were limited and the ciliary vessels were dilated. A bruit could be heard over the orbit and head. Both eyes had corneal nebulae. The case was one of arteriovenous aneurism, and was not improved by ligation of the internal carotid. Sattler reported a case of pulsating exophthalmos.

Augstein described a case of bilateral pulsating exophthalmos, caused by a wound in which the muscles of mastication and the sternomastoid of the left side were completely torn to pieces, the ramus of the lower jaw, the malar bone and the joint destroyed, and the facial nerve paralyzed. Later pulsation of the carotid could be felt, the veins of the upper eyelids were distended and tortuous; and both eyes protruded, the right 23 mm., the left 20 mm. The exophthalmos remained the same upon changing the patient's position. The intraocular tension was raised. A pulsation, synchronous with the beat of the heart, was felt by the hand placed on the closed lids. Over the entire skull a vesicular murmur could be heard, synchronous with the carotid pulse. After ligation of the carotid artery the exophthalmos and pulsation subsided.

Subsequently fine pigment anomalies appeared in the retina, together with whitish lines of opacity and punctate hemorrhages in the left, although the vision remained normal in both eyes.

Watanabe's case of spontaneous pulsating exophthalmos occurred in a boy 19 years of age. Ligation of the carotid artery was performed with good results. Key reported a case of pulsating exophthalmos in a man aged 49 years who had received a severe blow with a club on the right side of the head two months before. Five days after the injury he noticed a slight protrusion of his left eye, which has gradually become worse. Pulsation of the globe, synchronous with each heart pulsation could be seen and a well defined bruit pulsation could be heard. The X-ray plate gave no evidence of injury. Digital pressure caused the pulsation to stop.

Krauss' case of exophthalmus was due to the enormous engorgement of veins in the orbital fat. The patient, a woman aged 59 years, with a negative family history, had a systolic blood pressure of 215 mm. There was no history of traumatism, V. = 5/15 in both eyes. Retinal veins were engorged. Treatment consisted of rest, iodides, nitrites, and intermittent compression of the common carotid. There was a gradual subsidence after which the patient complained of a sudden, severe pain in the right eye, followed by intense proptosis of the right eye, and marked exophthalmos in the left eye. The pulsation in the right eye became pronounced, but was absent in the left eye. *Ligation of the ophthalmic vein* was resorted to by the supraorbital and retrobulbar routes. (See O. Y. B., v. 13, page 306.) Dodd's case of unilateral exophthalmos was first noticed a month after a severe blow on the side of the head. The eye was proptosed 5 mm., with no other symptoms whatever.

Bedell reported a case of traumatic pulsating exophthalmos in a woman, aged 66 years, who had for three weeks complained of severe pain over the right parietal region, accompanied by

nausea and vomiting. A history of injury to the right parietal region was elicited. Vision and fundus were normal. Several months later she complained of orbital tightness and diplopia. The eye proptosed and pulsated. A distinct bruit could be heard over the globe extending to the right temporal region. The case was seen before proptosis occurred, and the fundus changes noted during the development of the symptoms. Ligation of the carotid was followed by recovery of ocular position and movement, but with optic atrophy.

For pulsating exophthalmos, **Golovin** advocates ligation of the superior ophthalmic vein.

The clinical history of five cases operated upon is given and the author concludes as follows: Ligation of the superior ophthalmic vein is under all circumstances less dangerous than ligation of the common carotid. It is indicated particularly where the aneurism has involved dilation of the veins of the face. Where the cerebral symptoms (noises in the head and paralysis), are prominent, ligation of both the ophthalmic vein and the common carotid are indicated.

In all cases where, along with the symptoms of aneurism, there may be the smallest suspicion of a neoplasm of the orbit, resection of the outer wall of the orbit is called for to begin with, in order to provide free access. If there should be a tumor, its removal can be proceeded with. If the condition turns out to be a purely vascular distention, the access is sufficiently free, even if the dilated vessels should lie to the inner side of the orbit. In cases where the symptoms of aneurism leave no doubt as to the diagnosis, he considers the resection of the outer wall of the orbit unnecessary; as thru a moderately sized incision made below the eyebrow, sufficient access can be obtained to effect the ligation of the vein without difficulty.

In cases of recurrence after, or failure from ligation of the common carotid, ligation of the vein is necessarily indicated as preferable to ligation of the carotid of the other side. If there

should be an aneurism on both sides, the indication would be ligation of both superior ophthalmic veins, not ligation of both carotids.

**EXOPHTHALMIC GOITER.**—**Means** and **Aub** studied exophthalmic goiter from the point of view of basal metabolism, and showed the importance of such work from a diagnostic as well as from a prognostic point of view.

**McDonald** gave the history of six cases of exophthalmic goiter and was impressed by the variability of different symptom groups. He reviews the investigative work of a number of authors and concludes that this experimental work has shown dependent relations between the thyroid and the adrenal activities in Graves' diseases; the presence of the thymus; the relation and coexistence of the thymus and the suprarenal; and the effect of the increased secretions of individuals of the vagotonic or sympathetic makeup. When their findings are applied in an attempt to interpret cases of exophthalmic goiter, we can see the basis for the variability of type in this disease.

**Reede** has outlined the continuity of events leading up to exophthalmic goiter as follows:

- (1) A period of infection leading up to hyperplasia of the thyroid and goiter, with or without symptoms, and beginning often in childhood.
- (2) A period of increased physiologic demand inducing hyperthyroidism.
- (3) The stage of rapid metabolism and highly sensitized bodily functions known as hyperthyroidism.
- (4) The period of emotional stress in which originate the stimuli to suprarenal secretion.
- (5) The stage of suprarenal oversecretion, with the appearance of general sympathicotonic symptoms, and the localization of the brunt of the effect on the cervical sympathetic.
- (6) The stage of degeneration, and the breaking down of the cardiac, mental, visual, nervous, thyroid, and suprarenal mechanisms.

**Witherspoon** reviews the literature and pleads for early diagnosis of exophthalmic goiter. **Welt-Kakels** presented a patient, a boy 14 years of age with exophthalmic goiter, who gave a



history of emotional shock. **Levison** in his observations upon certain types of toxic goiter, remarks that he is convinced that exophthalmic goiter is a surgical disease and should be operated on early, before permanent damage is done to the heart and other organs. **Olivieri** and **Ronchi** give the details of injecting boiling water into the thyroid gland. They injected 10 cc. of boiling water alternately into each one of the lobes of the thyroid at different points each week. The improvement was marked, the nervousness subsiding; as also did the tachycardia, exophthalmos and goiter in notable degree.

**Suker** has described a new *ocular muscle symptom*, in exophthalmic goiter, which he designates as "deficient complementary fixation in lateral eye rotations." After extreme lateral rotation of the eyes, to either side, with the head fixed and with fixation of an object at about 3 or 4 feet, on attempting to follow this fixation point as it is rapidly swung into the median line, one of the eyes—it may be either—fails to follow the other in a complementary manner into proper convergence and fixation for this point, when it is brought into the median plane. Either the right eye or the left eye makes a sudden rotation into the fixation with its fellow, but before it does so, an apparent divergent strabismus is manifest. In exophoria this divergence is more marked, in esophoria less so.

**Simpson's** paper deals with *Roentgen ray treatment* of exophthalmic goiter. His conclusions are: (1) That X-raying the thyroid gland alone will sometimes relieve the symptoms of Graves' disease. (2) That the blood count, fluoroscopic, and X-ray picture examinations are often misleading, and should not have too much effect on prognosticating the favorable and unfavorable cases. (3) That the X-ray will quickly and painlessly atrophy the thymus gland; and for this reason should be the method of choice in all cases of exophthalmic goiter where enlarged thymic glands are suspected. The same author, in a later paper, relates the history of a number of cases

treated with X-ray. **Hernaman-Johnson** speaks highly of the effect of the X-ray in cases of exophthalmic goiter. In order to obtain the quickest results, sittings must be given three times weekly at first, comparatively small doses being employed. The X-rays particularly influence the pulse rate, tremors, and sweating, and have less influence upon the physical manifestations of the disease, as exophthalmos and thyroid enlargement.

In **Knapp's** case of *suppuration of both corneas* in a patient, aged 35, suffering from exophthalmic goiter, the cornea of the left eye sloughed and the eye was eviscerated. The cornea of the right eye, in the lower half, was infiltrated with pus. It was treated with irrigations, applications of argyrol and bandaging, without any result. The eyelids were then sutured, following the suggestion of Priestley Smith. The upper part of the cornea cleared, a small perforation took place below, and a necrotic plug was cast off. An optical iridectomy was performed upward. The vision was 6/200.

**ANEURISM.**—**Shannon** reported a case of aneurism of the internal carotid artery, and describing its effect upon the patient's vision said: "Two days previous to the examination, the patient, a woman, aged 52 years, noticed that the vision of the right eye was blurred. Vision, counting fingers at 3 feet. Pupillary reaction, normal. Media clear. Fundus normal, but the visual field showed a small central scotoma of the dumb-bell variety. The Wassermann test was negative. Examination of the sinuses and an X-ray of the skull proved negative. There were never headaches or cerebral symptoms at any time. The condition in the eye grew gradually worse; the blind areas in the field increased in size, and the color fields disappeared. Finally the patient succumbed to an attack of apoplexy. The autopsy discovered an aneurism of the right internal carotid artery, near the circle of Willis, which had burst, flooding the third, fourth, and lateral ventricles. The aneurism had caused pressure upon the right optic nerve."

**ENOPHTHALMOS.**—**Jickeli's** case of traumatic enophthalmos occurred in a boy of eighteen years of age after having been struck on the left temple and brow by a brick. Some days later he noticed that his left eye had become smaller and that he had double vision, although the eyeball was uninjured and the vision normal. Accessory sinuses were normal. The author concludes that, the immediate onset of enophthalmos and diplopia, as well as the larger left pupil, the lessened power of accommodation, the narrowing of the palpebral fissure, the continued contraction of the pupil in the dark, and the reduction of the corneal and conjunctival reflexes, could be explained only thru a change in the suspension apparatus of the globe, caused by a sudden stretching, pulling and partial laceration of the fascia, which enabled the muscles to retract the globe so that its movements resulted in disparate retinal images.

**Komoto** and **Hari** reported a case of *traumatic enophthalmos* upon which a *Krönlein operation* was performed. During the course of the operation a thin, tough strand of connective tissue was found attached to the posterior scleral wall, and the tension thereon caused the enophthalmos. **Lutz** reported a case of congenital enophthalmos in connection with complete absence of abduction, and retraction of the eyeball in adduction. A number of photographs are used as illustration, as well as a reproduction of an X-ray plate showing opacity in right orbit, indicating increased ossification in the bones in this situation. According to the patient's history, he suffered from fever early in life; which possibly led to an inflammation at the apex of the orbit (periostitis), and caused paralysis of the abducens and retardation of the development of the orbit.

**ORBITAL CYSTS.**—**Zentmayer** presented a case of microphthalmos with orbital cyst in a boy aged 17 years, who was born with the present condition of his left eye, except that the swelling about the eye had increased since the twelfth year. There was a swelling of the lower lid, with ectropion and ob-

literation of the culdesac. A globular tumor could be felt thru the lid, which seemed to be attached toward the temporal side and was but slightly movable. In the upper inner portion of the orbit there was a small rudimentary globe having limited movements. The cornea was 4 mm. in diameter. The X-ray did not show the cyst. In the right eye there was a partial coloboma of the optic nerve.

**Burns** described a case of dermoid cyst in the orbit of a girl, aged 8 years, following an injury to the head, six years before. The eye was displaced forward and outward, and there was diplopia. Vision was almost normal. The X-ray examination showed a tumor involving an area in the orbit, temporal fossa, and cranial fossa on the right side of the skull. The tumor was removed and recovery was uneventful.

**Koyanagi's** case of *blood cyst* in the orbit and lids, occurred in a woman, aged 25 years. There was a swelling of the upper left lid, which communicated with the orbit and which proved on extirpation to be a large blood-cyst, containing two roundish thrombi which had undergone chalky degeneration. The outer wall of the cyst was composed of connective tissue and the inner wall of the epithelium.

**TENONITIS.**—**McBean's** case of serous tenonitis occurred in a woman of sixty-seven. She had a paralysis of the external rectus muscle, with edema of the ocular conjunctiva. Under the administration of iodides and salicylates it soon cleared up. A month later she awakened with intense chemosis of the left ocular conjunctiva, so that she could not close the eyelid. A Snellen suture thru the lid was applied, and the treatment with iodides and salicylates continued, together with multiple puncture of the edematous conjunctiva and a pressure bandage resulted in a cure. His second case was one of orbital cellulitis occurring in a child, 3 years of age, who had swelling of the left eyelid and marked proptosis and a temperature of 102°. There was rhinitis on that side with watery discharge. Deep orbital probing did not reveal any pus. A few days later a



swelling formed in the region of the lacrimal sac. No pus was found. Recovery resulted in a few weeks.

**CELLULITIS.**—**Mongel's** case of orbital cellulitis with *optic neuritis* occurred in a man, aged 23 years, who previously had an attack of influenza. In the right eye there was intense chemosis and edema of both lids. V. = 23/200. There was proptosis down and out, and absolute suspension of ocular movements. The cornea was clear. The media were transparent and the fundus showed a typical picture of optic neuritis. A large amount of pus was evacuated thru an incision along the orbital floor toward the nasal side.

After a few days the eye became normal. Vision 20/20. Since the X-ray of the sinuses was negative the only explanation could be metastasis or endogenous infection from grippe.

**Fox** reported a case of orbital cellulitis occurring in a child aged 5 years. Postnasal examination showed a mass of adenoid tissue. An injection of staphylococcus and streptococcus vaccines was given. Resolution resulted without surgical interference. His second case was in a boy aged 9 years, who had bilateral pain, marked exophthalmos, edema, and a temperature of 104°. No history of any injury to the head could be found; but an open infected wound of the left ankle was found. After treatment of the ankle wound with the evacuation of pus from incisions in the culdesacs of both conjunctivas recovery was rapid.

**Terson's** case of orbital cellulitis occurred in a child, aged 3 years. A purulent *rhinitis* preceded the orbital inflammation. After nasal treatment and inunction with colloidal silver ointment, the temperature became normal and the swelling disappeared.

**Chance** reported the case of a negress of about 35, who had some fifteen years ago symptoms of neuroretinitis, and a proptosis which was then believed to be caused by orbital tumor or cellulitis. Large doses of iodides allayed the symptoms and reduced the proptosis. The patient continued well until a short time ago, when in addition to protrusion of the globes accompanied

by immobility, there was enormous chemosis. This chemosis was so great and the cornea so cloudy that the eyeground could not be seen. There was a yellowish conjunctival discharge containing the pneumococcus. X-ray examination and Wassermann reaction were negative. With the usual local treatment and inunction of iodid of mercury the discharge became watery and the proptosis and the chemosis subsided. The author considered it a case of conjunctivitis with infiltration of the orbital tissues.

**Mayou** reported several cases of orbital suppuration. His first case was one of suppuration of both orbits, as the result of a boil on the bridge of the nose. On the right side the abscess was subperiosteal and the ethmoid cells became secondarily infected. On the left side the pus was confined to the cellular tissue of the orbit. The second case was a case of frontal sinus suppuration simulating a lacrimal mucocele. Case three was an abscess in the right eyebrow simulating frontal sinus suppuration. In his fourth case there was suppuration in Tenon's capsule. The right eye was proptosed and pushed straight forward, and the conjunctiva edematous; the iris was discolored. Vision was reduced to counting fingers. The proptosis increased. There was marked iritis and a purulent exudation in the vitreous. The abscess burst thru the conjunctiva between the insertions of the external and the superior recti. There had existed at the same time an inflammation of her right ankle-joint which subsided without suppuration. His fifth case was also one of inflammation of Tenon's capsule, pyemic in character, secondary to cystitis due to staphylococcus aureus. Edema of the anterior surface of the lens and purulent matter in the vitreous. In this last case there was suppuration in a lacrimal sac presenting above the tarsal ligament.

**Roberts** and **Harris'** case of *empyema of ethmoid and frontal sinuses*, with perforation of the inner wall of the orbit, occurred in a boy, 16 years of age. The left eye was completely closed by an intense swelling of both

lids. Pus was evacuated thru an incision of the left eyebrow, and the frontal sinus was opened. The ethmoidal cells were opened by the nasal route. **De Kleijn** advocates the endonasal treatment in affections of the frontal sinus complicated with orbital lesions.

**Posey** reported an unusually large *mucocoele* of the frontal cells, which had simulated an *osteoma* of the right orbit. It was drained thru an incision under the brow. The frontal cells had perforated into the nose. His second case was that of a *prelacrima* tumor resulting from disease of the anterior ethmoidal cells. An orbital incision and drainage of the cells into the nose, by breaking thru the ethmoid plate and inserting a drainage tube, effected a cure.

In **Prendergast's** case of ethmoiditis in a child, aged 6 years, complicated by unilateral exophthalmos, the ethmoidal cells and the maxillary antrum were drained and a cure effected in three days. **Dolger** reported a case of orbital abscess due to suppuration of the ethmoidal cells in a man aged 27 years. The proptosis and diplopia disappeared promptly after endonasal treatment. **Stein's** case of proptosis was due to an infection received while swimming. Pus was found under the periosteum of the roof of the orbit and in the ethmoid and the frontal sinus.

**Stilwill** and **Coover** reported a case of unilateral proptosis in a boy, probably caused by an abscess in the orbit. **Miller's** case of orbital abscess within the muscle cone was due to an infection from the maxillary antrum. The abscess ruptured immediately internal to the attachment of the superior rectus muscle. Exploration of the abscess with a probe showed it to be in the muscle cone. In orbital complications of frontal sinus disease **de Kleijn** prefers endonasal treatment. In acute cases, **Burger** prefers endonasal treatment, and in chronic cases, endonasal treatment of the sinuses with opening of the orbit. **Guix** also advocates endonasal treatment in acute orbital inflammations. **Posey** exhibited a case showing excellent cosmetic and visual results a year after operation

for extensive *mucocoele* of the frontal and ethmoidal cells.

**ECHINOCOCCUS CYST OF THE ORBIT:**—In **Calderaro's** patient, a girl of four years, an echinococcus cyst developed following a blow on the forehead. When first seen, six months after the swelling was first noticed, the eye was destroyed and the tumor projected beyond the lids to the size of a mandarine orange. There was an obscure sense of fluctuation. Blood examination showed 18% of eosinophiles, but after eliminating a number of round worms, this was reduced to 10%. **Guedini's** biologic reaction was positive, but the intradermal reaction (**Cosoni's**) was doubtful. The entire cyst and the stump of the eye with a long piece of the optic nerve, were removed and examined microscopically. Marked local eosinophilia in the cyst wall was found, but not in the ocular tissues. The condition of the globe and the nerve could be explained as a result of pressure, and there was no evidence of any inflammation due to the toxicity of the hydatid liquid. **Krivososoff** reported a case of echinococcus of the orbit.

**LARVAE IN ORBIT.**—**Murzin** also reported a like case affecting the orbit. **Azer Wahba** reported four cases of fly-blown orbit, three of them in children of 18 months to 3 years. The appearances resembled panophthalmitis, except that the lids were more extensively involved and large holes were found in the tissues. There was discharge of pus in all cases; and in the children this contained gonococci suggesting that a gonococcal conjunctivitis had preceded the invasion of the tissues by the larvae. The number of worms varied from three to fifteen and one of the holes left, from which three had been extracted, was large enough to admit the end of the little finger.

**TUBERCULOSIS.**—**Yebara** found, in a 9-year-old girl, a right sided exophthalmos with slight inflammation of the lower lid, due to a tumor-like milary tuberculosis of the orbit. During the enucleation, the orbital tumor was found to be a tubercular inflammatory process, lying closely behind the eye. In all probability, the disease origi-



nated, not from the periosteum, but from the sheath of the optic nerve.

**SYPHILIS.**—**Cantonnet and de Saint-Martin's** case of gumma of the orbit occurred in a man aged 34 years. The eye was proptosed. The ocular movements were limited in all directions. Injections of cyanid of mercury and the administration of iodids resulted in a cure in fifty days.

**ANEURISM IN CAVERNOUS SINUS.**—**Fisher's** case of aneurism of the cavernous sinus, occurred in a woman aged 59 years. The patient suddenly felt giddy and fell down some six steps. She remained unconscious for five hours, and vomited on recovering her senses, and was sick occasionally during the next two or three days. There was no positive evidence of a basal fracture. On the third day after the fall, the woman's right eye became prominent. When seen seven weeks later, there was marked pulsation of the eyeball, and a thrill was felt. A loud bruit was audible over the eyeball and the right frontotemporal region. There was paralysis of all extrinsic muscles of the eye, except the superior oblique. The pupil did not react to light. After rest in bed and the administration of iodides the vision rose from 6/24 to 6/9.

**THROMBOSIS OF CAVERNOUS SINUS.**—**Bonacker** reported a case of thrombosis of the cavernous sinus, complicating an acute mastoiditis. The patient recovered with perforation of the cornea and luxation of the lens.

**LOSS OF ORBITAL MARGIN.**—In **Knapp's** case of fracture of the frontal bone, in a boy ten years of age who had fallen two stories, there was a defect in the anterior surface of the frontal bone, involving the orbital margin. The eye was pushed down and out and there was a soft circumscribed prominence in the upper and inner part of the orbital opening, corresponding to the frontal sinus. There were no eye or brain symptoms. This mass could be reduced on pressure without causing any pain. The diagnosis seemed to lie between meningocele, hernia of orbital fat, or distension of the lining of one of the accessory nasal sinuses.

**RODENT ULCER OF ORBIT.**—**Turner** reports the history of sixty-six cases of malignant disease treated with radium. A description of a trocar for the introduction of radium tubes is appended. In one of his cases, a man 60 years of age, with an extensive rodent ulcer involving the orbit, a good cosmetic result was obtained with scarcely any subsequent contraction. The writer prefers to divide the necessary dose into two or three, administered at three or four days interval.

**RETAINING FLOOR OF ORBIT.**—**Van Hook** describes his method for retaining the floor of the orbit, in resection of the superior maxilla. The ordinary resection operation is modified as follows: A wire saw passes under the malar bone, to the anterior part of the sphenomaxillary fissure, thence traversing the cavity of the orbit to the lacrimal groove, entering the nose through a perforation of the shell-like bone and emerging from the bony nasal frame-work. Six illustrations accompany the original paper.

**PROSTHETIC OPERATIONS.**—**Adam** recommends the implantation of a piece of fat, taken from the thigh, to form a better stump for a prosthesis after enucleation or evisceration of the eyeball (See p. 156). He exhibited a large number of prostheses devised for the varying conditions that result from battle-wounds; for contracted orbits, for partial or complete loss of the lids, for funnel-shaped cavities in the orbit, for coincident ptosis, and for use in the intervals between plastic operations on the lids.

**Franke** describes his modification of **Oehlecker's** procedure for the formation of a stump after enucleation or evisceration, consisting in using a small apophysis of a tarsal or carpal bone. As this procedure cannot often be made use of for lack of material, he conserves his material in Ringel's fluid. In order to fasten it, he uses three sutures, which he passes deeply from above downward without engaging the muscle in the suture. **Zarzycki** uses a piece of bone and its periosteum obtained from the tibia for implantation into the capsule after enucleation.

**Sourdille** introduces a skin graft, 28 by 30 mm. in diameter, and including a thin layer of fat, into Tenon's capsule. This fat is fixed by the threads previously passed through the recti tendons. In injuries complicated by palpebro-conjunctival or orbital lesions, especially where the malar bone or outer wall of the orbit has been destroyed, he has used bony grafts taken from the surface of the external malarolus. **Aymard** employs spheres constructed from costal cartilage as prothesis for the eye. The cartilage sphere is placed inside of Tenon's capsule and sutured. He then sutures the conjunctiva.

**Zentmayer** exhibited a case of contracted socket in which a double Maxwell operation had been performed five years previously. The pedicle grafts in the culdesac had not shrunk, and the patient was wearing an artificial eye with satisfactory results. The upper lid was so distorted, and so matted and drawn into the orbit, that the "Maxwell" procedure did not seem indicated. He then proceeded by the method devised by Schwenk (see Oph. Y. B., 1916, p. 312).

**Carlotti** and **Bailleul** have devised a new operation for improving the appearance and mobility of artificial eyes after removal of the eyeball. This consists in (1) removing a piece of costal cartilage with its perichondrium; (2) removing the eye; (3) dissecting a pedunculated flap of skin from the upper lid and passing it into the orbit through a button-hole at the external canthus; (4) suturing the skin flap to the cartilage; (5) suturing the recti muscles to the cartilage; (6) closing the wounds in the lid and conjunctiva. **Schwenk** showed a case of contracted socket in which he devised a new feature of transplanting a flap with pedicle. (See A. J. O., Vol. 1, p. 55.)

**CONTRACTED SOCKET.**—**Posey** referred to the case of a young man whose orbit has been almost obliterated as the result of a lime burn. The lower culdesac, restored by the Maxwell method, was amply deep; but there was some drawing downward of the outer half of the lower lid. He had observed this

complication in all of the cases operated on by this method, and thought that the author had directed that too wide an area of skin be taken from the skin below the lid. In future he will so modify the incision, that, instead of a width of 10 mm., 7 or 8 mm., suffices. He had obtained a deep upper culdesac by splitting the external canthus; and implanting into the upper part of the socket, a long skin flap taken from the lid just below the brow. The outer canthus was repaired at the time of operation, by deep sutures tied over a button. A Fox conformer was kept constantly in the socket.

In **Allport's** operative procedure for the relief of contracted socket, the socket is opened and separated from the lower lid. A piece of block tin, perforated and in half-moon shape, is inserted into the lower portion of the socket. A Thiersch graft, large enough to cover the tin on both sides, is made and sutured to the tin, raw side out, the sutures passing through the perforations at its upper border. The graft covered tin is now forced into the lower culdesac of the socket. The lids are sutured to assist in holding the graft in position. In eight days the block of tin is removed, cleaned and replaced without sutures. In a few weeks the same operation can be performed on the upper lid. **Heckel** presented a patient on whom he had performed a plastic operation for enlargement of the right socket by means of a Thiersch graft.

**MASKS FOR DEFORMITIES FROM FACIAL WOUNDS.**—**Wood's** richly illustrated paper, deals with the history of four cases, in which he modeled masks for covering the facial wounds. When the surgeon has done all he can to restore function, to heal wounds, to support fleshy tissues by bone-grafting and to cover areas by skin-grafting, a casting is made of the patient's face in plaster of Paris. Having obtained the mould and dried it, the next stage is to French chalk it, and take from it a cast or plasticine squeeze, which provides a positive model of the patient's healed wound and the surrounding normal tissue surface. This model is developed



by sittings of the patient, and this stage is completed by taking another cast—a negative.

The manipulator reconstructs the destroyed features from the model taken from this negative mould, by building them up to match the corresponding or adjoining features, or from pre-wound photographs. A cast is then taken of this. Further manipulation is required for the fitting of an artificial eye, and the mask, in plaster, is complete. From this an electrotype plate is deposited. It is of pure copper, 1/32 of an inch in thickness. The fittings for the glass eye and attachment are fixed, and it is finally well covered with an electric deposit of silver. The attachment of the plate to the face is made by strong spectacles, spirit-gum, or ribbons. The plate is now pigmented to match the complexion of the patient. The eyebrows are painted and the eyelashes are made of thin metallic foil.

**Coulson** described a rapid process in making an orbital prosthesis when cicatricial bands and bony lesions have changed the orbital cavity. A putty-like product, called "pastelline" is employed to obtain a mould of the orbit. **Ramsey** uses vulcanite. It can be moulded with care and painted to harmonize with the surrounding parts of the face. The parts to be replaced are modelled in wax from which a plaster of Paris impression is taken. The soft rubber is then moulded on the plaster of Paris, and vulcanized. The artificial eye is cemented to the vulcanite lids. After these have been colored to match the neighboring parts, the prosthesis is attached to a spectacle frame.

**Valois** and **Rouveix** call attention to the importance of getting the whole moulding of the orbital cavity in one step, not only of the surface of the orbit but also of the transition folds. Plaster of Paris, or rather alabaster, is used by means of a small funnel with a large opening for the admission of the liquid plaster. On the side opposite

to this funnel is a convex part reproducing the inner surface of the eyelids. From this mould a counter-mould is obtained having the exact aspect of the empty orbit. The prosthetic eye is made of caoutchouc or vulcanite, which transmits the least movements of the eyelids, or of the fundus of the cavity.

In **Valois'** patient, a workingman, the eyelids, the bulbar and palpebral conjunctivas and the cornea, were burned by molten metal. The eye was eviscerated. The end result was total symblepharon. Subsequent operation was refused. A mould of the orbital region was taken and studied. A zone was located in which active movements were present and a zone of relative fixation was noticed. A double prosthesis was constructed, the one covering the fixed area or defect of the orbit and lids; and the second a glass prosthesis attached to the first. The double prosthesis is held in place by a spectacle frame. The glass eye receives its motility by the movements of the scleral stump thru the eyelids.

**Lauber** and **Henning**, after destruction of the eye, removed the lacrimal gland, the conjunctival glands and the accessories in order to prevent secretions. Necessary plastic operations upon the orbital border were made to insure the retention of the prosthesis. A plaster cast is given to the patient, which furnishes him the model for the prosthesis, made of a plaster mass.

**EXPLOSION OF ARTIFICIAL EYE.**—**Weidler** reported a case of explosion of a Snellen artificial glass eye in the orbit. The patient, a woman aged 45, had worn reform eyes for the past ten years. For a week before the eye exploded the patient suffered intense pain in her head, and the socket discharged pus. After working in her kitchen over a hot gas stove, there was suddenly a peculiar explosive noise in her head, which was followed by pain in the socket. When the broken eye was removed, a hole was found in the central part of the rear surface about 4x6 mm. in size. (See also p. 154.)

## TUMORS

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This section reviews the literature from January, 1917, to July, 1918. Certain benign tumors are mentioned in the sections relating to the regions in which they occur, as cysts in the anterior chamber under Anterior Chamber, subconjunctival cysts under Conjunctiva, etc.

**LACRIMAL TUMORS.**—Alt describes the microscopic structure of a partly *pigmented nevus* of the caruncula lacrimalis. The arrangements of the nevus cells in the tumor gave the impression that they had their growth from the deeper connective tissue parts towards the epithelium. Very few nevus cells proper contained pigment, the larger amount of chromatophores lay in the small layer of connective tissue. This seems to support Ribbert's view, that nevus cells are of connective tissue origin, rather than Unna's opinion that they are derived from the outer epithelium.

Pfingst removed a mass from the region of the lacrimal gland. It extended well back in the orbit, measuring half an inch in length, and weighing three and a half drachms. Histologically, the growth resembled a salivary gland. It was benign and of mixed tissue. The tumor, which had been present about three years, was observed in a male, aged 48 years. A case of lacrimal tumor is also presented by Jocqs. Urayama discusses lymphoma of the tear sac with elephantiasis of the upper lid.

**TUMORS OF THE LIDS.**—*Sarcoid* of the eyelid is reported upon by Derby; the pathologic examination is by Verhoeff. The authors were unable to find in ophthalmic literature any reference to "sarcoid," which they use in the restricted meaning given it by Boeck in 1899. The accompanying case history is that of a female, aged 25 years, from whom a small growth in the outer half of the right upper lid was removed. Three months later, there was recurrence, at which time a more complete excision of the parts was done, with no return. A very complete record of

the pathologic findings, a full discussion of the subject, together with some twenty-four references follows. The paper is of unusual interest, and should be read in the original, as it does not lend itself easily to abstract.

Prevedi describes a transparent *cyst* of the ciliary margin of the lids. Castresana's contribution is on congenital *dermoid* of the lid. Levitskaya reports on an extensive lymphoma of the cul-de-sac of the upper eyelid, penetrating into the orbit.

An Italian, aged 50 years, was exhibited by Holloway. The patient was first observed March 25, 1915; at which time there was present a large *epithelioma* about the internal canthus, involving the inner portion of both lids. Beginning at the middle of the lower lid, there was an ulcerating area the size of a five-cent piece. Attached to the inner edge was a flap-like mass partially covering the globe. A rather smaller area involved the upper lid. An extensive curettement and application of pure carbolic acid were followed with satisfactory results. Recurrences three months later necessitated a second and third curettement, followed by three applications of radium. At the time of reporting, about two months later, the eye looked well with only about 5 mm. of the outer extremity of the lower lid remaining.

Jessop observed a man, aged 55 years, with an *epithelioma* at the center of the left upper lid. The accessible parts were removed, and 10 mg. of the pure radium bromid was applied unscreened, for one hour. No recurrence in two months. The patient was an X-ray worker who had lost all fingers of one hand. Of the three cases of *epithelioma* of the lower lids ob-



served by **Katayama**, two were at the canthus. In **Johnson's** second patient, a case of epithelioma of the cheek and eyelid, in a female aged 50 years, was of four years duration. The fat and Wolff graft were taken from the abdomen. There was no recurrence for six months.

In view of the relative frequency of epithelioma due to certain irritants, **Herz** reports a case in a man aged 56 years. The growth, one centimeter in diameter, was at that part of the nose where his tortoise shell spectacles rested. The mass was excised with satisfactory results.

The occurrence of two different types of malignant disease, in the same patient, within a year, was **Valentine's** unusual experience. A female, aged 55 years, had an epithelioma of the lid removed. One year later, vision of the left eye failed. Examination revealed an intraocular growth. The enucleated eye revealed a mass 9x10 mm. One pathologist stated that it was a glioma. A further examination found it to be a fairly typical leucosarcoma. The author does not believe there is any connection between the two conditions.

**Johnson** observed a squamous celled sarcoma, involving both lids, the ball of the right eye and extending downward on the nose. The growth began ten years previous, in a female, aged 65 years. Complete exenteration of the orbit, removal of all affected parts, and filling in of the orbit with fat, from the thigh, and swinging into place a large skin flap from the forehead was the surgical procedure. Two years after the operation there was no evidence of recurrence. **Kosima's** patient was a man, aged 41 years, with *bilateral endo-thelioma* of the lower lids. Death ensued from brain tumor.

**TUMORS OF THE CONJUNCTIVA.**—**James** and **Trevor** report the clinical histories of two cases of *hemangioma* of the palpebral conjunctiva forming pedunculated tumors. One patient was a youth, aged 17 years; the second a girl, aged 13 years. The term "nevus" used in the pathologic reports on these two cases has been applied to tumors of

which the strictly correct description should be "*hemangioma simplex*." The term nevus is applied commonly to vascular tumors without regard to their more intimate structure. It is generally agreed that a simple vascular nevus is a congenital malformation rather than a true neoplasm.

The cases here described belong to the class of true blastomas, and consist of large endothelial cells arranged in many layers around spaces or tubules containing blood. In both cases, the growths are slightly lobulated, the second case more than the first. In both, there is an irregular area around the periphery of the tumors, and, in the second case, this bears on the outside the patchy remains of a covering of several layers of flattened cells belonging to the palpebral conjunctival epithelium. The authors found surprisingly few references in literature to similar cases.

*Angioma* of the conjunctiva of traumatic origin was observed by **Marin**. A female, aged 52 years, four years previous, injured the superior culdesac with a stick. The mass was about the size of a small hazel nut. At its outer part, the palpebral opening was occupied almost in its whole length by another growth of the size and shape of an almond. The two swellings were parts of the same tumor. A complete cure was obtained by three treatments with bipolar electrolysis at intervals of about three weeks.

**Fuchs** observed a *lymphangioma* at the site of a cystoid cicatrix. The eye had been removed on account of a mild endophthalmitis, ten days after an extraction of cataract. The lymphatics passed thru the scar onto the posterior surface of Descemet's membrane and the stump of the iris.

A highly pigmented *dermoid* was observed by **Shikano**, occupying the exact center of the lower palpebral conjunctiva. A Chinese farmer observed by **Kosima** showed a sausage-like thickening of the conjunctivas of both eyes, which were composed entirely of small lymphocytes. A rice granule was found in the left eye. *Papilloma* of the conjunctiva is discussed

by **Hepburn**. **Valli's** paper deals with experimental granuloma of ocular tissues.

**Crisp** states that primary epithelioma of the conjunctiva is not of extreme rarity. A peculiar feature is that they may exist and develop over long periods of time without involving vital structures. The sclerocorneal limbus is, perhaps, the most frequent site. A few cases described have developed on the base of an old pterygium. The case reported was in this position. It measured 4x5x2 mm. No recurrence was observed four months after removal. **Finnoff** made a microscopic diagnosis of epithelioma.

**Jeau** presented a case of *sarcoma* of the conjunctiva which had occurred after removal. Radical measures were not resorted to owing to the fellow eye being practically blind. Complete extirpation is to be done. **Kurkoff** reports a case of epibulbar melanosarcoma. **Casolino's** patient had a lymphosarcoma of the bulbar conjunctiva. **Gallenga's** patient presented a lymphangio-endothelioma of the same tissue.

**TUMORS OF THE CORNEA AND LIMBUS.**—Very excellent microphotographs accompany **Marchi's** contribution on some rare observations of atypical trachomatous pannus of the cornea in the form of a tumor. One interested in the pathology of this subject should read the original. Two cases are described in which the masses approximated 10 mm. by 6 mm. and 2 mm. elevation. In one, the mass occupied the center of the cornea; in the other, the superior internal quadrant. Microscopically, the tumors were covered with epithelium somewhat altered in places. Round and oval cells gave the staining reaction for plasma cells. Here and there were numerous round hyalin globules. Bowman's membrane was completely destroyed. **Levitskaya** reports the rather unusual condition of *fibroma* of the cornea.

**Willetts** demonstrated **Meanor's** patient with melanotic sarcoma of the cornea. The patient, a male, aged 68 years, stated that a spot had been noticed on his right eye for ten years. When first observed by **Meanor**, the

growth was entirely corneal extending from the temporal limbus to the center of the cornea. Later melanotic spots appeared in the neighboring conjunctiva.

**Lamb** reports the microscopic findings in five cases of growths of a papillomatous nature. The condition was observed in patients ranging in age from 51 years to 75 years. One patient had multiple growths at the limbus; another at the nasal limbus; the third, at the temporal limbus; one, at the nasal canthus; and the fifth, at the center of the margin of the lower lid. Microscopically, these growths may be confused with spring catarrh, fibroma, tuberculosis, acanthosis nigricans, and, most frequently, with epithelioma. *Papilloma* is a benign growth possessing a great tendency to recur. They should be removed early, going well out into healthy tissue, and this to be followed by cautery.

A patient, aged 53 years, with a small pterygium-like growth at the temporal margin of the cornea was observed by **Koellner**. The mass was excised, but during the succeeding five years, six recurrences took place, following as many removals. This occurred at different points about the limbus. At the time of the last excision 10 mg. of mesothorium was employed, and six applications of from one to three minutes were administered daily for eighteen days. The patient was then allowed to go home without any particular change. On his return five months later the growth had entirely disappeared. Microscopically the tumor was an epithelial new formation, without blood vessels and benign in character, the epithelial prolongations not having penetrated the underlying connective tissue.

*Epithelioma* of a papillomatous type was the microscopic findings in **Stieren's** case of tumor at the limbus. The mass was observed in a man, aged 45 years. It was mushroom shape, and extended from the external canthus overlapping the cornea. **Marbourg** reports a patient struck at the limbus by a piece of coal, several years ago. There remained quite a little pigment, which



subsequently was examined by a pathologist, who reported an absence of melanosarcoma. Two years after enucleation, the patient died from metastatic sarcoma of the liver.

**TUMORS OF THE IRIS.**—*Primary sarcoma* of the iris was observed by **Bell**. A man, aged 80 years, with a history of paralytic stroke twelve years, and a trauma of the left eye two years previous, complained of severe pain and loss of vision. In the upper nasal quadrant, between the cornea and iris, and apparently involving the latter structure, was a mass 3x6 mm. Tension was 52 mm. The patient refused surgical interference. Six months later the mass had increased, tension was 90 mm., and the eye painful. The organ was removed at this time. Dixon's pathologic examination showed a primary melanosarcoma of the iris, spindle cells predominating. The author concludes by stating: "I feel that the prognosis is always unfavorable when the sarcoma is excised. Iridectomy should be done only as an aid to diagnosis. I quite agree with Wood and Pusey who, after a thoro investigation of the subject, came to the conclusion that, when the diagnosis of iris sarcoma is established, the globe containing the growth should be immediately enucleated. That they do recur sooner or later when excised and are apt to produce general metastases. I feel that it is not fair to jeopardize the life of the patient by a compromise in the treatment, and, after all is said and done, in my opinion the radical operation is by far the safest in the end."

**Gifford** reports his experience of having systematically treated sarcoma of the iris by *radium*. Some two and a half years later the unusual opportunity of securing the specimen for pathologic study was afforded. His observations presented much the condition described by **Levin** and **Joseph**, **Morson**, **Wassermann**, and **Prime**. The cells showed no mitosis or evidence of spreading into neighboring tissues. The author's comment on this form of treatment is that the iris offers very favorable conditions for treatment by *radium* or *X-ray*. The rays reach the growth

thru the clear cornea almost as if it were on a skin surface and the results of treatment are as open to observation.

Of the two accepted treatments, iridectomy and enucleation, the author quotes **Wintersteiner's** opinions in favor of primary enucleation, except under certain well defined favorable conditions. (1) Vision in the eye is good. (2) The iridectomy offers no obstacle to complete removal. (3) The tumor is small, slow growing, well defined and at the pupillary edge. It must not reach into the anterior chamber, touch the lens or cornea, there must be no other pigment flecks of the iris, and tension must not be increased. There is some danger of iridectomy producing metastasis, but this is also true of enucleation.

**Argañaraz** and **Belgeri** found in all about twelve cases of leucosarcoma in the literature. Their experience is one for every 80,000 cases. **Hirschberg**, one to every 85,000, while **Kotomo** reported one for every 3,500 cases. The case reported is that of a woman, aged 28 years, who eleven years previously suffered a traumatism over the right eye. At the time of observation there was marked inflammatory ocular disturbance. Histologically the enucleated eye showed a perithelial angiosarcoma.

**Ziegler's** patient, with sarcoma of the iris, was a male aged 55 years. The anterior chamber was obliterated on the nasal side due to a tumor mass springing from the root of the iris. Sections of the globe showed a large pigmented tumor, located between the iris and lens, and an equally large leucomatous mass extending subretinally from the ciliary region into the vitreous chamber.

**TUMORS OF THE CHOROID.**—The use of the term *melanoblastoma* as a group name for all tumors composed of melanoblasts or chromatophores, **Forman** and **Hugger** believe has the advantage of not placing any emphasis upon benign or malignant forms. This compels a more accurate study of the individual tumor. The authors give the results of their studies from the labora-

tory of pathology of the Ohio State University. Four specimens of malignant melanoblastomas arising in the choroid are recorded. Each illustrates one of the four stages of the disease: The small growth, with no marked symptoms; the type with marked pain, the one with extraocular involvement, and the fourth which has metastasized.

**Komoto** contributes to the knowledge of primary uveal tract *sarcoma* with a report of 100 cases. This is the end of a long series, and the author selects from many observations the following: (1) Frequency, 0.018%; (2) Average age, 49.4 years, (one case aged 90 years, another aged 9 years); (3), Sex, the same; (4) No difference between right and left eye; (5) The tumors are usually spindle cells, leucosarcoma. The round cell form is seldom seen; (6) Pigmented and leucosarcoma shade gradually into each other; (7) The flat form of sarcoma may extend outside the globe by blood vessel extension; (8) Peripheral sarcoma may extend along the optic nerve and also the blood vessels, so the prognosis is worse; (9) Pigmented sarcoma appears more in the posterior portion; leucosarcoma the anterior; (10) The upper and the under portions of the globe are more affected; (11) phthisis bulbi may come on thru infection of the necrotic area, and more often occurs in the round-celled form.

By means of the ophthalmoscope, and the supporting evidence **Castresana** states that a diagnosis of sarcoma of the choroid can be made. The haze, the luminous sensation, scotoma, with diminution of the field, increased tension and metamorphosis, when the tumor is situated at the macula, form a clinical picture sufficient for an early diagnosis. Three cases are reported in which many of these symptoms were present.

**Alt** observed an unusual type of intraocular *angiosarcoma*. Microscopic examination of the cornea showed a great many more cells in the parenchyma than normal, especially in the periphery. The ciliary body was greatly atrophied. The patient gave a history of the eye becoming suddenly blind and

painful; this was later corrected in that the sight had gradually failed during the previous four or five months. At the time of observation, acute glaucoma, +3 tension, and the uncommon experience of exophthalmos were present. Later the inflammatory symptoms subsided and the tension became —1. There was nothing in the histologic findings to explain the rapid increase of glaucoma, combined with the marked exophthalmos, after the instillation of a few drops of eserine. Neither is there any explanation of the lowering of the tension, as we must assume the intraocular tumor was still growing within the eye.

A round-celled leucosarcoma of the choroid, in a man aged 52 years, is reported by **Shumway**. The first microscopic sections showed an isolated round nodule, lying between the thickened detached retina, and the lens, and composed of nonpigmented round cells, of the same size as the nuclear cells of the retina. There was necrosis of a considerable part of the tumor, leaving well staining mantles of cells surrounding the blood vessels, as in glioma; and the growth had the appearance of having sprung from the retina. Further sections of the other half of the eyeball, however, showed the tumor to have sprung from the choroid.

A case of sarcoma of the choroid, with certain striking features, by **Jackson** and **Finnoff**, is of especial interest. Over fourteen years elapsed from the time sight was noticeably impaired, and two and one-half years after glaucomatous symptoms had arisen, until the eye was enucleated. Microscopic examination demonstrated a spindle-celled melanosarcoma of the choroid, with metastases thru the globe into the conjunctival and orbital tissues. There was a mild panophthalmitis with a peripheral annular infiltrate of the cornea without perforation of the globe. The course of these protracted cases indicates that within the eye, influences are exerted which may retard or wholly check the development of such growths. One of these is probably the influence on cell life of intraocular pressure. The effect of abnormally high in-



traocular pressure is fairly well known thru the changes produced in previously normal tissues by glaucoma. It is rather probable that the normal intraocular pressure exerts some such influence unfavorable to cell life of a new growth. A good review of the literature on this type of case is given.

**McGuire** found of all malignant neoplasms, sarcoma to be the chief intraocular growth of adult life. Of all pathologic conditions of the eye, it occurs in only from .03% to .06% of cases. The writer reports three very instructive case histories. The first patient presented typical symptoms of acute inflammatory glaucoma in one eye, and in its fellow a deep cupping of the nerve was observed. Microscopic findings in the inflamed eye showed a spindle-cell sarcoma.

The second patient gave a history of having been kicked by a horse, above the right temple, some years previous. There was a small corneal opacity. The retina was detached, no pain or tension. Six weeks later slight pain was felt, and by oblique illumination, fairly accurate outlines of an intraocular growth were made out. The microscope indicated a melanotic sarcoma.

The third patient, a man, aged 48 years, had previously lost his right eye as the result of a specific iridocyclitis. The left eye showed thru a dilated pupil, a large reddish brown mass. A diagnosis of malignant growth was made. Enucleation and microscopic examination showed a melanotic sarcoma. The patient was still alive eighteen months later.

In a resumé regarding certain features of intraocular tumors, **Harbridge** reports of a man, aged 50 years, with a growth within the globe, who totally lost his vision in the right eye, two months previous to observation. No pain, redness or unusual appearance was complained of; the pupil was enlarged Tn. + 1. By oblique illumination a mass could easily be seen at the nasal side behind the plane of the lens. A very excellent microscopic report by **Finnoff** showed the growth to be a small spindle-cell melanotic sarcoma,

arising from the lamina fusca choroidea. A 7 mm. section of the optic nerve, which was obtained, showed no invasion. At the age of 61 years, eleven years after the enucleation, the patient was well and showed no secondary involvement.

**De Schweinitz** and **How** have detailed the case history of a *melanosarcoma* arising from the vascular layer of the choroid posterior to the base of the ciliary body. The growth was observed, by oblique illumination, as a chocolate brown mass. The woman, aged 40 years, gave a negative history. The tumor was sharply circumscribed and noninfiltrating; sections were very hard.

**Moore** refers to his previously reported four cases of *melanomata*. His recently reported patient was a man, aged 53 years. The general appearance was very similar to that of his former cases. There was no irregularity of pigmentation nor stippling of the tumor; the edges were slightly feathered, and not hard or sharp. The sectioned eye showed a mass 1.9 mm. in diameter, 4 mm. in thickness. It appeared to be formed in the more superficial layers of the choroid and composed of very broadly, spindle-shaped cells with pigment scattered unevenly thruout the growth. These tumors are of uncommon occurrence, and usually discovered by accident during routine ophthalmoscopic examination.

Five weeks following a fundus examination, in which the appearances seemed normal, **Clapp's** patient returned with a marked failure of vision. At this time, detachment of the retina was observed. Transillumination showed no dullness. About eleven months later, secondary glaucoma developing, the eye was removed. Three months later the patient died with metastasis of the liver. Microscopic examination showed melanosaarcoma of the choroid. It is most probable that the failure of transillumination was due to the light not getting far enough back. Attention is called to the value of making a small conjunctival opening and carrying the light backward toward the optic nerve. **Desogus** and

also Fagin each report cases of melanotic sarcoma.

De Salterain found upon examination of the literature on sarcoma of the choroid but thirteen or fourteen reported cases in children. One of his patients was a girl, aged six months, the other a boy aged 22 months. Prompt enucleation was done with no recurrence during the interval of the time of reporting; four and eight months.

Church discusses the clinical symptoms of sarcoma of the choroid. His first patient showed no evidence of metastasis in four years; the second patient did not submit to operation until four years after first being observed, at which time the sclera had become sacculated. Fraxanet and also Berg each report on cases of choroidal sarcoma. Hughes presented a patient in whom a diagnosis of sarcoma of the choroid was made. Section of the enucleated eye two months later showed no microscopic evidence of the growth.

Rumsey's experience with five cases of tumor of the eye is impressive of the importance of an early diagnosis, because of the light they are apt to throw on obscure parts of general pathology. Prompt enucleation often affords a very favorable prognosis. His first patient was a child, aged four years, with endophytum *glioma*. Enucleation of the eye showed no recurrence. The second patient, a woman aged 45 years, had a sarcoma of the choroid of a hematogenous pigmented type; no recurrence. A round and spindle-celled sarcoma of the posterior pole was observed in a man, aged 34 years. The growth followed some time after a head injury. At first a diagnosis of detached retina was made. The fourth case, a suspected melanotic sarcoma, covering a third of the cornea. Microscopic examination showed it to be an epithelioma; no recurrence. The fifth case was an extensive growth of the lower lid, lacrimal sac and part of the upper lid, in a man, aged 67 years. The eyeball, together with lids and sac, were removed. Microphotographic reproductions illustrate the paper.

Malignant growths of the eye is the subject of a communication by Allen. Shisoï's observations are on *metastatic carcinoma* of the choroid. Benign growth of the choroid is the subject of a paper contributed by Opin.

Adams reports the autopsy findings in which microscopic sections of the lung and liver tissue revealed melanotic sarcoma. The patient, a female aged 30 years, gave a history of having trouble with the right eye four years previous. Two years after this the organ was removed, presumably for an intraocular growth in the second stage. No microscopic examination was made at that time, but it is believed to have been the primary focus. Wheeler's patient, aged 40 years, showed an intraocular growth with a Wassermann +4. Specific medication was continued to the point of tolerance, but vision failed slightly.

Heed presented a boy, aged 15 years, exhibiting a subretinal mass in the temporal field of the right eye. He found an area of choroiditic atrophy, encroaching upon the macula; and, in juxtaposition to the lower border, there was a greyish circumscribed area protruding at least three diopters in advance of the retinal plane. Wassermann and von Pirquet reactions were negative. There has been no change in two years. A definite diagnosis has been deferred. An organized exudate resulting from the choroiditis had been considered.

TUMORS OF THE RETINA.—In the left eye of a female patient, aged 64 years, Hird found extensive ophthalmoscopic changes, especially in the macular region; V., hand movements; no rise in tension. Under the impression that he had to deal with a new growth, and after consultation, the eye was removed. The opinion was expressed by a pathologist that "it was a form of malignant growth springing from the retinal pigment cells rather of a sarcomatous nature." A subcommittee of the Ophthalmological Society, however, after examining sections, reported that "the case belongs to the type which was described by the late Mr.



George Coats as a form of retinal disease with massive exudation."

As far as Griffith was able to make out, he found six cases of *hereditary glioma* on record, which, with his own two cases, brings the total to eight. In a family of six children, four had double glioma, the mother having lost one eye in infancy, from the same cause. The two who escaped were bottled. Whether one can ascribe this immunity to this fact is not known. In the second family, of three children, one had bilateral, and two unilateral glioma. The mother lost one eye in infancy, from the same cause. Clegg is inclined not to place too much importance on the transmission from the mother. He believes this impression has been formed largely for the reason that it is usually the mother who brings the child, and the surgeon notes whether or not she has lost an eye.

O'Connor makes a most excellent contribution, together with illustrations, and a very complete list of references on *glioma retinae*. Interest in the case history cited centers in making a diagnosis, owing to the marked symptoms; and also whether the phthisis bulbi, or the glioma, was the primary conditions. Previous history of the case was vague and uncertain. A female, aged nine months, shortly after birth had a "blood-shot" eye, with a slight discharge. At the time of coming under observation, the globe was shrunken and irritable; rather later, its fellow became irritable, and under the impression that it was a case of sympathetic ophthalmia, the phthisical globe was removed. Pathologic diagnosis by Verhoeff was *glioma retinae* and *atrophia bulbi*. Subsequently the remaining eye developed all the clinical evidences of glioma. This eye was removed, followed two months later by death due to sepsis and exhaustion. The paper is well worth consulting by one interested.

Three weeks after a trauma of the left eye, in a child aged 8 years, Ring made a diagnosis of retinal *neuroepithelioma*. Upon the suggestion of an immediate enucleation the patient disappeared, and was not seen again for nine months, at which time the eye was re-

moved. Three months later there was a recurrence in the orbit, two-thirds the size of a baseball. The mass was removed by Clark's method of electrothermic surgery. Subsequently the child died, showing evidence of metastases. The report contains a good review of the literature.

In Taylor and Fleming's case of *bilateral glioma*, in a female child, aged 3 years, there was orbital recurrence followed by multiple metastases. In the same report Lawson read notes concerning a recurrent case in a boy aged 3½ years. Reference is made to all reported cases or metastases. Knapp presented the photograph of a case of *bilateral glioma* in a child, aged 2 years. The appearance was that of a fungus hematodes. The extension of glioma, if left to itself, is to proceed back, enlarging the optic sheath, which it then perforates. The minute the growth gains the loose tissue of the orbit, its progress is remarkably rapid.

In Hugger and Forman's case of so-called glioma of the retina, the group term *neuroblastoma* is used. There is present in the sectioned eye four whitish nodules. So completely does the tumor line the vitreous cavity that it is not possible to identify the retina at all. At the posterior portion of the tumor, cells have invaded the choroid and sclera. Pathologic notes and illustrations accompany the report. Both Leal and Haas have contributed to the subject of glioma.

TUMORS OF THE OPTIC NERVE AND SHEATH. — Photographs illustrate the good cosmetic effects obtained by Bane in his patient with *cyst of the dural sheath* of the optic nerve. A lad, aged 6 years, at the time of his first visit showed vision with the left eye almost nil a pearly white disc and a hyperopia of 3 D. Two and a half years later the eye ball protruded 5 mm. forward, downward and inward. The hyperopia had increased to 6 D. A tentative diagnosis of fibroma was made. The X-ray did not reveal any evidence of sinus involvement or solid tumor. The mass, together with a section of the optic nerve, was removed through a conjunctival incision 30 mm. long and 5 mm. external

to the cornea. During the operation the cyst collapsed, permitting the escape of a clear fluid. Finnoff's pathologic findings showed the optic nerve fibers atrophic; the pial sheath of a honeycombed appearance; and the dural sheath, greatly thickened; the endothelium in the anterior portion filling the space between the pia and dura. Posteriorly, the cells gradually thinned.

**Eleonskaia** reports the case of a tumor of the optic nerve in a boy, aged 6 years, of three years duration, apparently of benign character, in which all the topographic relations of the nerve are preserved, but considerably increased in their dimensions. There was a polymorphic character in the microscopic structure, and in the central parts, corresponding to the nerve trunk, a resemblance similar to *glioma* and *gliosarcoma*. There was also some degeneration and edema of tissue.

**Cecchetto** describes an ingenious new method of operation for the removal of a retrobulbar fibroma. **Shiosi** used the Krönlein operation for the removal of a tumor which proved to be a *lymphoendothelioma*. The growth had its origin from the posterior portion of the sclera, causing a kink in the optic nerve.

A *psammoma* of the sheath of the optic nerve was observed by **Ferro**. In **Shiosi's** two cases of intradural tumor of the optic nerve, histologically, one was a *glioma* while the other was a *myxoma*.

**Mansilla's** patient with *sarcoma* of the right optic nerve was a woman, aged 63 years. Exophthalmos, immobility of the eye and optic neuritis were present. The tumor, which was situated in the posterior part of the orbit, was adherent to the eye ball and optic nerve. The entire orbital contents were removed. Microscopically the growth was a fibrosarcoma. The descriptive pathology of a necrotic tumor of the sclerotic is contributed by **Alt**. **Edmondson** reports a lipoma of the optic nerve successfully removed by the Krönlein operation.

**TUMORS OF THE ORBIT.**—A clinical diagnosis of sarcoma of the orbit was made in **Wible's** patient. The dura-

tion of the growth was about two years. Following exenteration, the pathologic report of the specimen was *rhabdomyoma*. Few cases of this rare growth have been reported in literature.

The cosmetic results were almost perfect in the patient **Posey** exhibited, from whom he had removed an *adenoma* of the orbit. **Wright** reports a rare growth observed in a female, aged 58 years. Six years previous, she was operated upon for a femoral hernia, which may have been an ovariectomy. During a period of some twenty months the patient suffered attacks of pain in the left eye, followed by perceptible loss of vision. The eye was enucleated for chronic glaucoma. About six months later, a secondary mass was removed from the orbit. Microscopic examination showed the presence of a *malignant papillary cyst adenoma*. The walls of the eyeball were involved. Tumors of this type are usually found in ovaries, breast and intestinal tract, and never as a primary growth, at least, about the orbits.

**Coover** presented a patient, aged 11 years, from whom he had removed a *fibroma* of the orbit. The mass, 25 x 35 mm., was adherent to the foramen and optic nerve on the temporal side. In its removal the optic nerve was injured, necessitating enucleation of the globe. **Sander's** patient proved to have a tubercular tumor of the orbit.

**Griffith** exhibited a patient, a female, aged 33 years, with proptosis of the left eye, movements free in all directions. A distinct new growth was palpable, at the back of the eye. There was no light perception or pupil reaction; nevertheless, the optic disc was of good color and the vessels were full. **Calderaro** did an excision of a tumor of the orbit, without appreciable cicatrix and without enucleation of the globe. **Jansson's** patient has bilateral exophthalmos, due to tumor of the orbit.

**Cirincione** contributes the history and operative procedure in three cases of endorbital *osteoma*. In the first two patients, the mass occupied the upper inner part of the orbit. One occurred



in a man aged 25 years; the other in a girl, aged 16 years. The third patient was a man 21 years old, in which the mass occupied the whole orbit, pushing the eyeball forward so that the posterior pole was on a plane with the margin of the orbit. The operation consisted of practically excavating a new orbital cavity. The growths were from three to five years' duration.

In **Blanco's** case of *osseous tumor* of the upper part of the orbit, the eye deviated down and out. Removal of the mass was accomplished without any damage to the eye. **Stern's** patient had an osteoma. **Posey** exhibited a patient, a male, aged 19 years, with an orbital growth, possibly an osteoma. The mass was hard and bosselated, confluent with the supraorbital rim and merged with the inner wall of the orbit. The growth was first observed eight or nine years previous. Vision equalled 5/10. The mass was to be extirpated thru a large incision under the brow.

**Hupp's** case of *exostosis* of the orbit occurred in a man aged 26 years, who gave a negative family and personal history. Fifteen years ago, without apparent cause, there was noticed a small hard lump within the right orbit, on the nasal side. While for years this bony growth remained quiescent, a few months before examination, blurring of vision, diplopia and pain became manifest. A hard, rounded, bony tumor, the size of an English walnut, protruded from the nasal side well beyond the orbital margin. The tumor was removed and proved to be attached to the orbital plate of the ethmoid.

**Kalt's** case of multiple *exostosis* occurred in a boy aged 13 years. His personal history was negative, but the mother gave a history of *exostosis* of the ramus of the lower jaw. One of the bony growths was situated at the inner orbital margin on the left side, pushing the globe backward and upward. The tumor, the size of a walnut was removed. Its attachment was near the junction of the os planum of the ethmoid and the lacrimal bone. Similar *exostoses* were present on the left external nasal wall, the anterior lacrimal

crest, and the ascending apophysis of the superior maxillary bone.

An interesting experience is reported by **Chance**, in the removal of a *cavernous angioma* of the orbit. The patient was a female, aged 16 years, with a tumor first noticed soon after birth, which had gradually increased in size until it occupied the upper half of the left orbit. The mass extended from the upper margin of the internal rectus across the globe to the external rectus and backward indefinitely. The mass was accommodated by an absence of the middle third of the orbital ridge and roof, together with a fenestrum in the external orbital wall. Dissection of the mass was most tedious. The base rested on the upper outer aspect of the globe and was quite adherent to the sclera. Histologic study showed no capillaries or glandular elements, no cysts or signs of degeneration.

**Boot** observed a female, aged 21 years, with an angioma of the orbit. The first evidence of the trouble began about nine months previous. Of late the mass has markedly increased in size. There is a soft swelling at the inner part of the orbit; the upper eyelid is swollen. There is a distinct thrill felt and bruit heard. The growth does not extend into the nose. X-ray pictures show no evidence of erosion. The reporter discusses the various types of this class of tumor, their infrequency and possible appropriate methods of treatment.

An unusual orbital tumor was removed by **Wheeler** by the Krönlein method. A female, aged 40 years, gave a history dating back ten years, at which time she observed a small red spot in the right eye. At the time of examination, there was a large subconjunctival hemorrhage and a decided protrusion in the region of the lacrimal gland. Operation revealed a jellylike mass adherent to the lacrimal gland and outside the muscle cone. A small area of the upper part of the temporal wall of the orbit was deficient. Dixon considered this to be a hemorrhagic form of degenerating connective tissue tumor; Weeks, probably sarcoma;

Verhoeff, an unusual form of hemangioendothelioma. **Satake** also observed a hemangioendothelioma of the orbit.

Primary *sarcoma* of the orbit with anterior adhesive iridocyclitis is reported by **Ischreyt**. Exenteration revealed a necrotic sarcoma with a large cyst. In the enucleated eye, there was a close attachment of the root of the iris to the cornea and sclera. In spite of this fact, the tension was not increased but diminished. In **Posey's** patient with sarcoma of the orbit, the eye had been enucleated elsewhere four years previously, perhaps for sarcoma of the choroid. The recurrence in the orbit was a firm black mass occupying the position of the eyeball. Exenteration was followed by marked hemorrhage, which ceased upon the application of the Clark method of desiccation. **Zentmayer** observed a growth in the orbital fold of the left eye. The mass, 40x25 mm., extending from midline to the external canthus; it being encapsulated, was easily removed thru an incision. Microscopic examination showed a predominance of large round sarcoma cells.

**Darier** reports a case of melanosarcoma of the orbit which began as a small conjunctival speck. Ophthalmoscopically pigmented points in the retina, which had been noted, were found to be connected with the mass by means of vascular filaments. Thirteen months after exenteration there had been no recurrence. **Curry's** patient had the same type of malignant growth, while, in **Krebs' patient**, the sclera was involved.

Symmetrical bilateral *endotheliomas* of sarcomatous type, of the orbits, were removed by **Kirkpatrick**. They occupied the site of the lower lids and extended well back into the orbits. There was no glandular involvement. When last seen, three months later, there was no recurrence.

**Posey** exhibited a patient, aged 67 years, upon whom he operated and also used a desiccation, for a very extensive *epithelioma* of the orbit. One year previous, the first operation, with a pedicled flap from the temple, was per-

formed. Four months following this, there was a recurrence. Preceding the last operation an overripe cataract was removed from the fellow eye. Present appearances are very satisfactory.

A tentative diagnosis of an ethmoid osteoma was made by **Sattler**, following an exploratory operation. A lad, aged 14 years, during the preceding two years, had noticed a prominence of the left eye. Two months prior to his first visit, the protrusion became more pronounced. Thru a Krönlein incision, a very thoro examination of all parts of the orbit was made. An extremely hard protrusion of inner and upper wall was discovered, and the globe was enucleated to permit an easier access to the region of the ethmoid or sphenoid bones. After careful consideration it was determined not to proceed with the removal of the small and probable osteoma, but await results of future observation.

**Zentmayer** exhibited from the service of Chance, a probable case of malignant growth of the antrum. The patient, a female aged 60 years, had a firm ridgelike mass palpable just within the inferior orbital margin. A thoro examination of the patient had not been completed.

**TREATMENT OF TUMORS.**—**Clark** reports the *electrothermic coagulation* technic, which he employed on Ring's patient with recurrent neuroepithelioma. The protruding portion of the growth was removed by means of the bipolar d'Arsonval current, applied by a chain snare which was gradually tightened. In the second stage of the procedure, the same current was applied by means of a short knitting needle. The growth in the orbit was curretted away after coagulation by the current.

**Ring** exhibited a male patient, aged 65 years, from whose lower right lid he had removed, by surgical means, fifteen years previous, an extensive epithelioma. The denuded area was covered by epithelial grafts from the forearm. The lids remained normal until two months ago. The cicatricial ectropion now present is the outcome of a plaster treatment which had been applied to an epitheliomatous splotch on



the cheek; X-ray and radium having failed. Ring's purpose in presenting the case is not to advocate the use of plasters, notwithstanding its merit in this case, but to emphasize the fact that prompt, definite and more satisfactory results can be accomplished by the application of electrothermic desiccation, as carried out by Clark.

Massey has obtained very satisfactory results in the treatment of epitheliomas of the lids. For smaller growths, zinc ionization by the unipolar method is well adapted; while in the more extensive invasions the bipolar is quicker and more effective. The histories of twelve operable, and six inoperable cases are given.

## INJURIES.

THEODORE B. SCHNEIDEMAN, M. D., F. A. C. S.

PHILADELPHIA, PA.

This section reviews the literature of its subject from January, 1917, to July, 1918. The late results of injuries are often noticed in the sections referring to the various portions of the eye and its adnexae, which are involved.

**INJURIES FROM HEAT.**—In Ramsey's case of burn of both lids, the upper had been completely destroyed and there was marked ectropion of the lower. There was a small corneal opacity at the lower margin, probably resulting from a traumatic ulcer. Marked purulent conjunctivitis was also present. The treatment of a case like this is perplexing. A case of burn of the cornea from exposure to the heat of an electric arc is reported by Osborne. Two gray lines of coagulated corneal epithelium corresponded to the edges of the partially closed lids. These disappeared in twenty-four hours. Denig has reported a large number of cases of burn treated by transplantation of mucous membrane from the mouth.

**INJURY FROM ELECTRICITY.**—Mikami observed an extensive burn of the entire face from an electric current of 38,000 volts, resulting in complete bilateral ectropion. This was perfectly remedied by a large transplantation of skin without a pedicle. Burge has repeated his conclusions with regard to the influence of ultraviolet radiations in causing cataract. (See p. 88.)

**CHEMICAL INJURIES, GASSING.**—Gremeaux, of the French Army, comes to the following conclusions: The lacrimatory gases employed to date by the Germans cause more or less violent conjunctival reaction, accompanied by

exfoliation of the tissue of the limbus. The lesions rapidly attain their maximum, and under early treatment remain quite limited and progress towards cure under appropriate management. Length of exposure to the gases appears without influence, either as regards intensity of the symptoms or their ultimate course. The treatment of these cases is as follows: No occlusive bandage; mild lotions; pupil to be kept dilated, watching the tension; every second day 1% zinc sulphate; potato starch poultices in frequency according to the intensity of the hyperemia; a "floating" bandage to protect from light while leaving the eye uncovered. No cocain, as the epithelium has already been rendered friable by the action of the gas.

Teulières and Valois report the effects of gas upon the apparatus of vision. The gas affects both the anterior and posterior segments of the eye and also the adnexae. The lid margins show burns aggravated by excessive flow of tears. The lids themselves are edematous; there is excessive lacrimation without other lesion. The conjunctiva is congested, most markedly near the limbus; slight chemosis. There is severe and protracted congestion of the iris but no posterior synechia; the color is less vivid than normal and has a flocculent appearance; the pupil re-

acts sluggishly to light and slowly to mydriasis. The media have not been found affected. A mild degree of neuroretinitis occurs in many cases; the retina in the neighborhood of the disc suffers a peculiar change, becoming slate colored, thought to be due to edema; the discoloration is not limited to the immediate neighborhood of the disc but extends along the larger vessels; the veins are dilated, often tortuous. The visual acuity is diminished. As regards etiology, the writers believe that the gases produce a severe reaction in the mucous membranes of the nasal cavities and accessory sinuses; and that by this path and the cribriform plate of the ethmoid, the meninges of the optic nerve may be directly affected. The prognosis is favorable. **Petit** describes two cases in which the eye and eyelids were seriously injured by some liquid caustic contained in a bursting shell, which he supposes to be analogous to phosphoric acid. In each case one cornea ruptured and enucleation was required. These are the only two similar cases observed by the reporter in a large experience.

In **Hansell's** case, following a splash of *chloroform* into each eye, both corneas became superficially infiltrated and part of the epithelium destroyed; the conjunctivas were intensely inflamed, resembling subacute trachoma; perfect and rapid recovery followed.

**Brav** reported the effects produced by accidental instillation in the conjunctiva of *corrosive sublimat*. **Oloff** has written on injuries to the eyes from ink and anilin.

**CONTUSIONS.**—In **Juler's** case, following a blow, 13 days after the injury, the lower retinal arteries and veins were seen to end some distance from the disc, their extremities being curved backwards upon themselves. There was hemorrhage around the disc which was pale and slightly depressed with ill defined lower edge, on the retina below and in the vitreous. The retina below the disc looked edematous and was somewhat raised down and out. No light perception; two weeks later, the hemorrhage had disappeared and a considerable formation of fibrous tis-

sue, extending from the disc into the retina, had taken place. No foreign body in the orbit nor fracture of its walls appeared upon the skiagraph.

**Monaghan** observed rupture of the sphincter of the iris, following a blow. There was iridodialysis at the lower nasal periphery, and a rupture of the choroid near the macula with hemorrhages and pigment. Vision was reduced to counting fingers at 3 feet. **Schwenk** referred to the case of an engineer who was struck in the right eye by an owl while driving his locomotive; the choroid was ruptured and central vision destroyed. A case of contusion of the eyeball resulting in annular opacity of the lens and a hole at the macula is reported by **Berrisford**.

**Parsons** calls attention to the frequency of ruptures of both choroid and retina in war injuries of the eye, as against the rarity of retinal rupture when the choroid is torn in civil life. Attention to this has been specially drawn by **Lagrange** in his recent work on "Fractures of the Orbit." When the choroid alone is ruptured, a scar composed of a quite limited amount of fibrous tissue is formed, with relatively little impairment of vision unless the immediate vicinity of the macula is involved. When, however, both choroid and retina are involved, very considerable masses of fibrous tissue are formed, often projecting into the vitreous, with processes resembling those of retinitis proliferans.

For the cause of these processes **Parsons** suggested an explanation some years ago. He thinks that this proliferation of fibrous tissue in the scars of retino-choroidal ruptures appears to be susceptible of a similar explanation.

In these cases there is considerable extravasation of blood from the choroid and retina into the vitreous. In the ordinary vitreous hemorrhage due to rupture of retinal vessels there is little mesoblastic tissue in contact with the blood capable of providing fibroblasts to bring about organization of the clot, the vitreous being itself inert. When both choroid and retina are ruptured, the mesoblastic choroid offers an ample supply of active fibroblasts and the



clot organizes into a mass of fibrous tissue exactly as in hemorrhage into the other connective tissues. If this explanation is correct, it furnishes an argument against the method of removing foreign bodies from the vitreous by introducing the pole of the small magnet thru an incision which perforates sclerotic, choroid and retina; which procedure would further the risk of detachment of the retina, etc., from contraction of bands of scar tissue formed as above. No such objection holds against the plan of drawing the body into the anterior chamber with the giant magnet, preparatory to its removal from the eye.

**Leplat** saw a man who had been looking at a mortar, one meter or more away when an explosion occurred. He exhibited blood in the anterior chamber, ciliary hyperemia, impaired vision, and a pupil that dilated unequally under atropin, but at the end of sixteen days the eye became normal.

In **Shumway's** case contusion of the eye caused rupture, extending across the optic disc. There was no wound of the eyelids nor eyeball but hemorrhage into the anterior chamber and vitreous obscured the iris and fundus. Vision was reduced to perception of hand movements on the temporal side below. Later an iridodialysis was found at the lower border of the iris; and when the vitreous cleared up, in the course of four months, a tear was discovered extending across the lower third of the optic nerve. At this point there was a depression, over which ran a band of newly formed connective tissue. The retinal blood vessels were interrupted at the disc margin and there was a broad area of atrophy of the choroid bordering the tear, and much superficial disturbance of the retina beyond.

The reporter observed that there are only three cases on record, where a tear across the nerve has occurred from contusion without penetration, the usual rupture being in the choroid. In every case the tear had been at the lower border of the nerve, and he thought that the blow produces sudden violent rotation upward of the eye-

ball and thus causes a separation of the nerve from its scleral attachment.

**Whiting** classifies concussion changes of the lens according to position and shape of the lens *opacity* as follows: 1, posterior cortical (a) stellate; (b) irregular, probably arrested development of a stellate opacity. 2, anterior cortical, (or subcapsular) (a) annular, (b) disco-annular, (c) discoid, (d) double discoid, (e) stellate, (f) irregular. He describes each of these varieties somewhat at length and relates a series of cases, 32 in number, including examples of all the above varieties. His discussion relates to the nature of the injury and the various changes that occurred during observation, etc.

**Harriet** observed unilateral posterior polar cataract following the explosion of a shell, a few meters away from two soldiers who were near each other at the time. Nine days later there was no sign of wound of the eyeball in either case. In one there was a small superficial scar at the lower border of the orbit near the nose. In each case there was persistent mydriasis, and a stellate opacity at the posterior pole of the lens; which latter became opaque thruout, in both patients. Harriet considers the cataracts to have been caused by the impact of aerial waves from the shock of the explosion. **Lawford**, commenting upon these cases considers that, in the absence of all evidence as to the conditions present immediately, or shortly after the injury, it is difficult to accept this view of the etiology as the most probable.

**Frenkel** thinks that traumatic subluxation of the lens is much more common than is generally supposed. He groups cases under two headings: (a) typical, diagnosis certain; (b) atypical cases, difficult to diagnose and in which the following are the most valuable signs: (1) Existence of a fold in the iris concentric with the circulus major and limited to a portion of the circumference, shown by a single (sometimes double) line, produced by the close apposition of the iris to the edge of the subluxated lens; (2) diminution of the pupillary reflexes, and partial mydriasis; (3) unilateral corectopia; (4) mi-

nute tears in the iris, near the root, or in the sphincter area; (5) retroversion of the iris at the free edge of an iridodialysis; (6) partial traumatic cataract; (7) acquired myopia or hypermetropia. Three varieties are described; (a) with rotation of the lens on an equatorial axis; (b) with displacement of the lens backwards; (c) with displacement forwards: the latter is that most frequently overlooked. The proportion of cases of subluxation at the Ophthalmic Center of Toulouse was, in 1915, 2 per cent in a total of 547; in 1916, 7 per cent in a total of 518.

Black reports conjunctival hemorrhage in one eye following a railroad injury. Both eyes were highly hyperopic with astigmatism; vision in each eye equalled 20/40 with correcting lenses—a result which seemed disappointing as a medico-legal case was impending.

Terrien thinks his case of *manifest* astigmatism following contusion of the eye, to be unique. A nurse after contusion of one eye had a visual acuity of 2/10, (the vision had been full before the accident), while that of the other was normal. Ophthalmometric measurements showed corneal astigmatism of 3 D. with the rule right and left. The shadow test gave 3 D. of myopic astigmatism with the rule for the injured eye, and emmetropia for the other. A —2.50 cylinder, axis horizontal, raised the vision from 2/10 to 9/10; the same cylinder lowered the visual acuity of the normal eye.

It might be concluded that the diminution of the acuity was due to suppression of the natural correction of the astigmatism by the ciliary muscle. But the writer holds that the astigmatism was the consequence of a traumatic spasm of the accommodation as a whole, in support of which he cites the contraction and rigidity of the sphincter pupillae, as well as the narrowing of the range of accommodation (between 10 cm. and 20 cm.); and finally some amelioration of the acuity after atropin. He draws the conclusion, which will hardly be admitted by oculists generally in this country that

the total corneal astigmatism should never be entirely corrected so long as the accommodation is sufficient to compensate the same, and that the strength of the correcting cylinder should only be increased in proportion as presbyopia advances, so that the youthful eye may be encouraged to correct any astigmatism present in whole or in part by the action of its ciliary muscle.

In Miller's first case, a boy aged 9 received a kick over the right eye which dazed but did not produce unconsciousness; he walked to his home. Three days later he was admitted to the hospital. The right upper and lower eyelids were seen to be markedly swollen and dark colored from effusion of blood. There was a small laceration of the upper lid at the inner canthus where the upper was torn from its attachment. The eyeball itself seemed uninjured and the patient was able to see quite well with it; although it seemed rather proptosed and fixed, with movements very limited in all directions. Both pupils were dilated, equal though sluggish in their reaction to light. The boy did not complain of pain in the eye and there was no subconjunctival hemorrhage.

In the evening of the same day he became rapidly worse and died 8 hours after admission. The autopsy showed a fracture of the os planum of the ethmoid on the right side, and also a fracture of the cribriform plate of that bone. In addition there was an abscess in the early stages of formation affecting the anterior inferior surfaces of the frontal lobes of the cerebrum. Some dirt had evidently been conveyed to the seat of the fracture, giving rise to the acute infection and rapidly fatal termination.

In a second case a child of six had been struck in the eye with a stick. On the following day the eyelids were slightly swollen. Upon separating the lids under a general anesthetic, all that could be made out was a wound or tear in the upper part of the plica semilunaris. Three days later the lids were much more swollen and there appeared to be definite orbital cellulitis. While preparing to make an incision into the



orbit, convulsion occurred, temperature 106.6, pulse uncountable, Cheyne-Stokes breathing, small hemorrhage from both nostrils. In fact she had an attack like the previous case but recovered. The following day a free incision into the orbit evacuated a quantity of pus. The child was better after this but lost the power of speech and the left arm was paralyzed. Trephining over the right Rolandic area failed to find pus. Three weeks later upon reopening the wound a large quantity of pus squirted up out of the brain substance, but the tract from which it came could not be determined. There was great improvement for a time. A month later, a large hernia cerebri developed; she lost flesh and power in both left arm and leg. An unsatisfactory effort to deal with the hernia was made by turning back the skin flap and abscising a portion of the brain tissue. Death at the end of 2 months. The autopsy showed extensive abscess of the frontal lobe of the right side, with patches of meningitis on the dura; no signs of fracture. The writer concludes that these two cases point to the necessity of making free incisions into the orbit early, where cellulitis is suspected, and of not waiting for "pointing" and a feeling of fluctuation. Further, if the skull is opened, an attempt should be made to open as near the site of the injury as possible.

In **Hansell's** first case, the patient was blown out of a room by an explosion in a powder mill; several fellow workmen were killed. The patient believed that his eyes were blown out; they were found to be absolutely uninjured, nor was there any serious lesion elsewhere. In a second case an eye had been struck with a forcibly thrown wad of paper. A few days later vision declined without pain or signs of inflammation. The ophthalmoscope showed a patch of retino-choroiditis with vitreous opacities; both conditions improved under active diaphoresis.

**Krückmann** writes upon simultaneous injuries of the eyes and antral cavities. In fractures of the upper jaw and of the orbit, a bone fracture occasionally extends into the posterior wall of the

frontal sinus. Even when the mucosa remains intact, subsequent operative procedures in the frontal sinus may lead to opening of the small scar with consequent meningitis. Occurring secondarily in inflammatory conditions of the frontal sinus such injuries should be treated as conservatively as possible during the first three months. It is to be hoped that recent roentgenographic procedures will render possible the recognition of such delicate fractures.

**Marin** reports a case of a woman aged 75, who received a blow upon the inner side of the left orbit two days before examination. The blow was followed by violent pain in the eye and immediate loss of vision. At the examination the lids were edematous and the conjunctiva chemotic; there was moderate hyphema, the pupil was contracted, the iris intact, the fundus inexplorable on account of hemorrhage into the vitreous, the tension diminished, vision equalled light perception with good projection; the eyeball was tender to pressure in the ciliary region. There was a linear wound of the sclerotic in the upper outer quadrant, the borders of which were slightly separated by choroidal tissue. The wound was covered thruout by the bulbar conjunctiva, which did not show the slightest solution of continuity. There was a roundish swelling beneath the outer portion of the ocular conjunctiva about equal in diameter to that of the cornea, at a considerable distance from the scleral wound, due to the presence of the crystalline lens beneath the conjunctiva. The lens was removed after cicatrization of the scleral wound. A case of corneoscleral rupture of the eyeball with prolapse of the crystalline lens is reported by **Glagoleff**.

**PENETRATING WOUNDS OF EYEBALL.**—In **Black's** case the cornea was split from the nasal limbus to the center with iris entangled in the wound, by a flying piece of glass; the lens appeared clear and the conditions seemed favorable. Two days later a picture of extensive deep infection was presented; the wound was clean, the anterior chamber reformed and half full of yellow pus. Cyanid of mercury was in-

jected subconjunctivally, causing a most violent reaction; but the progress of the infection was at once arrested; slow resolution left the iris adherent to the lens, which was partly opaque, the coloboma filled with exudate and the tension raised to 60 mm. mercury.

**Sattler** reports a case of fatal tetanus following a lacerated wound of the eyeball, made by an arrow shaped from a bit of horseweed. When seen thirteen hours afterwards there was evidence of very serious reaction, and the eyeball was enucleated that day. The case did very well until the afternoon of the third day when symptoms of tetanus appeared. In spite of large doses of antitetanic serum, intravenously and intraspinally, the patient died seven days after admission.

**Boehm** discusses penetrating injuries of the eyeball by fragments of lead. Such injuries occur in war when, as described by Handmann, the rifle ball strikes steel buckles, or stone in the wall of the trenches, or when it passes through sand. The aluminum covering of the ball breaks, the lead nucleus is melted and pulverized into particles of varying sizes, from a seed grain to a cloud of lead in a state of minute subdivision. The reporter has seen many such cases. The Roentgen rays render a great service in the detection of such foreign bodies especially with the aid of the diapositive of Wesely.

In five enucleated eyes it was possible to demonstrate positively that the fragments were lead. The microscopic and macroscopic appearances of these eyes are minutely described. Different interesting cases are related showing that the injuries produced by the passage of lead to the fundus remained aseptic. They also prove that fragments of lead, if introduced aseptically into the eye, behave more favorably toward the tissues than other metals; lead is doubtless but little soluble in the vitreous. The prognosis is good even as concerns sympathetic ophthalmia.

**Edwards** presents a paper upon penetrating and nonpenetrating injuries of the eye based upon a large personal material. In over four years he has

seen but one case of sympathetic ophthalmia, having observed and treated 1,700 injuries of the eye in the past 12 months. The greater number of these were of minor importance, tho there were 23 cases of panophthalmitis, in which number but 5 enucleations were performed. After inflammation has subsided, 3 cases retained 20/30 vision in the injured and 20/20 in the uninjured eye. The others have vision ranging from 20/40 to 20/100 except one case still under treatment, in which a promising result may be expected. The writer insists upon the necessity of rigid asepsis in the treatment of foreign bodies of the cornea and the desirability of keeping such cases under observation for 24 or 48 hours after the injury. He details several instances of perforating wounds, in all but one of which the results were most satisfactory. He insists that the aseptic technic of all operative interferences upon the eye should receive as much consideration as in opening the abdominal cavity.

**Löwenstein** notes that in mountain warfare wounds from pieces of stone are very frequent. The resulting corneal infection may be treated with tincture of iodine. Small intraocular fragments are often well borne. In wounds of the globe Kuhnt's conjunctival covering is to be recommended. In warfare upon plains and wooded hills, ocular wounds constitute 2 per cent of the total of all wounds; (Servia and the Carpathians). In mountain warfare they constitute 8 per cent (12 months in the Alps). Of 98 perforating wounds 78 were due to fragments of stone; in 35 cases both eyes were injured. Metallic fragments were as often magnetic as nonmagnetic.

These ocular lesions were very frequently accompanied by injuries to the cranium. Injuries to the face usually suppurate rendering aseptic operations upon the eye impossible. The diagnosis between contusion and perforation was very frequently difficult, the perforation being very small in some cases and the anterior chamber filled with blood. Fragments of stone are well supported by the tissues of the



eye. Of 21 wounds of the crystalline lens, in 17 the deeper structures became involved, and finally the eyeball as a whole. In 4 cases the opacity began in the anterior cortex and remained localized there. Of 133 perforations, in 17 only was the sightless eyeball removed. So far as Löwenstein was able to follow the wounded under his care, he has not observed a single instance of sympathetic ophthalmia; he accordingly recommends conservative treatment in wounds of the eyeball received in mountain warfare.

In Halliday's case the tendon of an *inferior rectus* was torn across by a piece of hanging wire. When examined upon the following day, the eye could not be turned down. Below there was nearly half an inch of the tendon of the inferior rectus still attached to the eyeball, the free edge lying upon the cheek. The severed tendon was united by catgut sutures with an excellent result.

In Krauss's case a red hot piece of steel about 2 inches long and the thickness of a narrow lead pencil, penetrated the tissues just beyond the outer canthus, passing thru the ciliary region, then apparently between the posterior capsule of the lens and the limiting membrane of the vitreous, to the opposite side of the lens; the patient at once pulled out the hot foreign body, burning his fingers. Perfect recovery took place with 5/9 vision at the end of four weeks. There was a large scar beyond the outer canthus, two triangular discolorations over the ciliary body and a brownish rust colored translucent discoloration across the entire lower fifth of the lens, and a second discoloration in the outer third of the lens. The rest of the lens and vitreous were clear and the eye quiet. The X-ray was negative.

Stilwill observed, following a blow over the eye, much swelling and discoloration of the lids, edema of the conjunctiva, with a ragged cut thru that membrane upon the temporal side; the anterior chamber was filled with blood, the eyeball soft, the cornea clear, and the vision nil.

Bulson, while recognizing the serious nature of penetrating wounds of the eyeball, makes a strong plea for conservation in the treatment of such injuries. He lays down the rule that every injured eye possesses potential possibilities of being saved by proper treatment; altho conservation should not be carried to the extreme point where prolonged efforts are made to preserve a shrunk and sightless globe. He divides penetrating wounds into two classes—simple penetrating wounds, and those accompanied by the lodgment of a foreign body within the globe. Small and not infected wounds posterior to the ciliary region are comparatively inoffensive. The edges may be touched with tincture of iodine, covered with a conjunctival flap, and the lacrimal sac thoroly flushed with normal salt solution.

Larger openings into the vitreous chamber with considerable loss of vitreous even if not infected, do not offer so favorable a prognosis. But even such wounds, provided not more than approximately 20 per cent of the vitreous has been lost, should be closed with fine catgut scleral sutures, painted with iodine and covered with a conjunctival flap. Where there has been extensive loss of vitreous, prompt enucleation should be practiced. Active infection is not necessarily an indication for enucleation, for subconjunctival injections of cyanid of mercury, especially if made early, have been known to check severe intraocular infection.

In uncomplicated wounds of the cornea alone, sutures may facilitate prompt healing and help to prevent complications from prolapse thru delayed healing. A prolapse of iris usually calls for abscission. If the lens is injured and dislocated, and removal is possible without much loss of vitreous, attempts at saving the eyeball may still be made. Even in injuries involving the ciliary region treacherous as these are, a reasonable amount of conservatism is justifiable, depending upon the extent and nature of the injury and experienced judgment. The internal administration of calomel and sodium

salicylat and subconjunctival injections of cyanid of mercury are deserving of more extensive use.

Foreign bodies lodged within the eye should of course be removed when possible; even after successful removal the prognosis is always serious. Less than one-third of successful removals result in preservation of the eyeball, tho it is possible more might be saved if greater efforts were put forth to abort or lessen the infection. If it be remembered that sympathetic inflammation does not occur in less than three weeks from the date of the injury, a delay of 10 days or two weeks is comparatively safe.

The writer summarizes the aids in promoting the best results as follows: 1. Application of tincture of iodine to edges of all wounds after cleansing with normal salt solution; 2. Closure of all gaping wounds by sutures and covering with a conjunctival flap; 3. Bichlorid salve in the culdesac; 4. Iced compresses and the internal administration of calomel followed by large doses of sodium salicylat as a preventative of inflammation; 5. Subconjunctival injections of mercury to abort or retard infection; and lastly due consideration of the fact that sympathetic inflammation does not occur in less than three weeks from the date of the injury during which time efforts to save the eyeball are attended with little or no risk.

The account of the Halifax disaster by **Tooke** will be found in the *JOURNAL*, Vol. 1, p. 323. The leading features of a great number of cases that occurred was their improved behavior under open treatment and irrigation with the Dakin-Carrel solution, and the absence of secondary infection following necessary operations on the eyeball.

In **McKeown's** case of an inch long horizontal incision of the cornea and sclera, there was extensive loss of vitreous and a large prolapse of the iris; this was abscised. A few months later, when the eye was manifestly a danger to its fellow enucleation was advised but refused. In a case of wound of the sclera with continued severe hemorrhage that did not yield to ordinary treatment **Brunetière** and **Amalric**

sutured the wound which promptly checked the bleeding. The importance of suturing the eyeball and covering wounds with conjunctiva as soon as possible after injury has been urged by **Krusius**.

**Key** reports a case in which a penetrating wound 11 mm. long thru the limbus and cornea healed under a conjunctival flap with preservation of good vision.

In **Chance's** case, the lids, to the outer side of each punctum, were lacerated quite completely, in a line extending from the brow and lower orbital margin, which also severed the lacrimal canals. The cornea also had a clean linear wound. Complete healing resulted but with ectropion of the lower lid with annoying epiphora.

**Zentmayer** observed a girl six years of age, in whom the vision of the left eye was lost from an exploding dynamite cartridge; the skin in the peri-orbital region showed numerous small depressed scars; the lens was partially opaque.

**INJURIES FROM SPECTACLE LENS.**—**Gifford** argues that while spectacle lenses are very rarely a source of injury to the eye, they are much more frequently a valuable protection against injuries, so that he urges all persons who have only one eye or in whom the other is amblyopic never to go without goodsized spectacles with strong rims. The protection which spectacles afford is so much greater than the risk which they involve that every person, child or adult, with only one good eye should habitually wear them.

In **Burns's** case a blow broke the spectacle lens, a piece of the lens cutting the cornea. The crystalline lens was also cut and the anterior chamber partially filled with blood. The reporter cleansed the anterior chamber and removed, as he thought, all of the lens substance; he dissected up the lower half of the conjunctiva and sutured it over the cornea to the upper conjunctiva; the cornea healed and about one-sixth of the lens could be recognized, not having been removed;



the latter became nearly absorbed, but the vision is nil.

**FOREIGN BODIES.**—A foreign body in the eye claimed by the patient to have been caused while following his regular occupation was shown by the nature of the foreign body not to have been so received. **Van Weerd** reports the case of a workman who claimed compensation for injury to the eye received from the harpoon in the course of his regular vocation, that of a harpoon fisherman. The injury consisted of perforation of the cornea; the piece of steel extracted from the eye was not derived from a harpoon as the claimant asserted. Professional compensation was accordingly disallowed. It is superfluous to state this did not occur in this country, but is reported from Holland.

**Teal** recalls that foreign bodies on the cornea constitute the majority of corneal injuries. In removing such bodies, the layman is apt to attempt too much, his efforts resulting in a large denuded area. He should limit his attempts to a cotton wound tooth pick, lightly brushing the cornea where the foreign body rests on the surface. Where the foreign body is embedded, it is necessary to lift it out under cocaine, for which purpose the writer prefers a sharp spud. When a small stain or eschar is present, it is best to remove this also unless it is too deeply imbedded, when it may be left for 24 to 48 hours. The wound resulting may be cauterized or disinfected followed by petrolatum or yellow oxide of mercury and a light bandage. Injuries of the cornea without perforation are benefited by the application of heat. This may be applied by an electric light bulb held in contact with a wet compress, plus several layers of black cloth. Lime burns are treated as any corneal injury. In perforating wounds asepsis and antisepsis are as important as in abdominal injuries; protruding parts must be replaced or excised. Conjunctival flaps with suturing of the edges of the cornea are of great value.

In **Allport's** case, an electric flash occurred near the patient's face; so far as he knew no foreign body entered the eye. When examined the following

day both eyes were somewhat inflamed; the vision of both was 20/30; there was no abrasion by the fluorescein test, no opacity of the cornea nor of the lens. Examination showed a glistening foreign body at the extreme lower angle of the anterior chamber, corroborated by the X-ray. As the foreign body and iris were held together by sharp points upon the body, extraction with the forceps and a small iridectomy were necessary. Recovery with unimpaired vision took place.

In a second case reported by **Allport** the eye was struck by a small foreign body. Careful examination by a physician found nothing; but two weeks later the vision was impaired with the eye uninflamed. Examination disclosed a slight corneal opacity directly over the pupil; the lens was cataractous and exhibited a piece of steel in the center, corroborated by the X-rays; the steel was removed with a magnet, and the cataract, later, with good results. These cases are noteworthy in that they show the possibility of the eye harboring steel without the occurrence of immediate symptoms.

In a case in which a small fragment of brass was lodged in the iris near the lower angle of the anterior chamber, **Roy** seized the pupillary margin and drew up the iris so that the particle could be clearly seen. It was then easily removed with another pair of forceps. In other cases the foreign body was found embedded in the sclera or even outside of it.

**Boyd** observed a piece of steel lodged in the posterior lens capsule. In 30 days a traumatic cataract was visible with pain, redness and iridocyclitis. Upon subsidence of this inflammation, a cataract operation was performed and the steel came out with the lens; the foreign body should have been visible with the ophthalmoscope. The reporter observed that if he had seen the case soon enough, he would have removed the lens earlier—a procedure open to question.

**Buchanan** reports at some length an instance of metal embedded in the lens with restoration of normal vision after nine months. A brass finisher had

been struck three days before observation by a chip of metal, which the patient stated was soft iron, and the sight was becoming dim. There was a small wound of the cornea just beyond the pupillary margin of the iris; the anterior chamber was formed and the sphincter of the iris was cut just behind the wound. In the notch so formed, there was a small mass of grayish tissue lying upon the lens capsule; the lens was slightly opaque, and in the center of it there was embedded what looked like a small chip of metal. The metal seemed to be lying behind the center of the lens and to measure about 1 mm. in each direction. The eye was quiet, tension normal; vision 6/60. Ophthalmoscopic examination showed that the lens was slightly opaque, due to small faint clouds slightly denser around the metal than elsewhere, without any radial lines of opacity. In the course of the following nine months the lens cleared entirely with restoration of full vision. The metal became very clearly visible, sharply defined and perfectly bright (no rusting). The patient experienced no inconvenience whatever; he could see the metal in a mirror, for it is clearly visible to an attentive observation.

The history of this case would indicate that the metal must have been quite aseptic (it was possibly very hot) to pass through the cornea and iris without giving rise to infection. The wound of the lens capsule seems to have been plugged by a small portion of iris left in the minute opening; this would explain why the lens did not become entirely opaque; the minute clearing of the latter probably depended upon the youth of the patient—20 years. The absence of rust may be due to the fact that the metal was soft iron and not steel. It is quite possible that opacity may develop when age begins to tell on the lens, but several years of useful vision may be hoped for before this takes place. The reporter cites half a dozen cases from literature in which useful vision was retained (in two for a period of thirty years), with a foreign body in the lens, in nearly all of which the subjects had been quite

young when the accident occurred, probably a determining factor in the favorable result.

In **Sweet's** case of injury from explosion of a dynamite cap, the left lower eyelid was wounded and a scleral wound was present, slightly below the horizontal meridian on the nasal side and about 4 mm. back of the limbus. The anterior segment of the eyeball was normal, the vitreous clear, and the fundus normal. Suspended in the vitreous a short distance back of the lens, slightly below the horizontal and about 1 mm. to the temporal side of the vertical plane, could be seen a thin, flat, silvery body, somewhat curved in its upper portion, which rotated on its vertical axis in movements of the eyeball. A number of sets of X-ray plates were made with the tube in various positions, but in no instance did the shadow of a foreign body appear on any of the plates. During the four weeks that the case was under observation there was no congestion of the external tunics of the eye, the vitreous continued clear, and the body remained in its first position. Toward the end of this period, there was greater movement of the body in rotation of the eyeball; but it always returned to the former situation. Careful examination failed to show the object to be an extraneous foreign body. The scleral wound and the appearance of the body seemed to point to its metallic nature, probably copper. The reporter believed that by illuminating the object through the dilated pupil by a hand mirror, it would be possible to enter a pair of Matthieu forceps through a scleral opening and secure the metal, though in the event of failure, enucleation would be necessary. Dr. Sweet believed the vitreous would ultimately become cloudy and the eyeball lost.

In **Spencer's** case both eyes were penetrated by foreign bodies from an explosion of dynamite caps. An hour after the injury, the right eyeball presented a punctured wound in the sclera about 2 mm. from the inner limbus, through which the iris had prolapsed; the left cornea showed a vertical linear puncture with a cut in the iris and the



anterior chamber filled with blood. Repeated X-ray examinations were negative, although the probabilities were strong that foreign bodies were present—copper, dirt or gravel. Seven weeks later, vision of the right eye equalled 6/20, that of the left 3/120; there was a large floating veil in the vitreous apparently attached to the scleral wound at the inner limbus, upon which a glistening metallic point was visible, the movement of which as the exudate moved may have been the cause of the failure of the X-rays to reveal the same.

**Zentmayer** reports injury from a dynamite cartridge; there was loss of vision in the left eye; no injury to the right eye was suspected; the left lens was partially opaque and the vitreous filled with a dark mass which appeared to contain a foreign body. The right cornea showed a very small macula at its lower outer margin; the lens was clear; in the vitreous, there was a shining, apparently metallic, oblong foreign body about one-half the diameter of the disc in length, and the diameter of a main trunk of the central vessel in width; there was a small irregular whitish lesion in the retina in a line with the foreign body. The radiograph showed, on the left side, numerous small foreign bodies scattered thru the orbit and eye. On the right side there were two shadows; no response was obtained by application of the magnet to the sclera. The reporter did not feel justified in attempting to remove the foreign body with forceps thru a scleral wound, as the eye was now normal aside from the foreign body. He thought the case should be watched; and, on the first appearance of irritation or synchysis, extraction of the foreign body should be attempted.

In **Claiborne's** case the eye was struck by a piece of metal in rebound from a Remington bullet against a piece of steel. The reporter saw the patient two days after the accident. There was a ragged wound of the cornea; the iris was torn and prolapsed into the corneal wound, the lens was cataractous. As the bullet was known to contain a small proportion of steel,

attempted removal was made with the giant magnet, but without effect. The prolapsed iris was removed and the wound treated antiseptically; recovery was uneventful with absorption of the lens at the end of six weeks, with vision 20/30 under the correction. The X-rays showed a foreign body just in front of the nerve head apparently encysted.

**Jessop** observed, one hour after an eye had been injured by flying splinters of steel, a scleral wound of that eye. In the macular region were 3 small polished black spots, and also limited edema. In the vitreous was a grayish veil, passing outwards to a white patch in the sclera at the nasal side of the optic disc. Skiagrams showed a foreign body in or just beyond the sclera. Vision equaled 6/9; three weeks later the eye had quieted down, and a small horizontal scleral wound, without any foreign body was seen at the nasal side of the optic disc. Some limited edema and the superficial black pigmentary changes at the macula were still visible. The principal interest in this case lies in the two facts: (1) That pigmentary changes at the macula should occur as early as one hour after the injury; and (2) that such changes should interfere so little with vision.

**Ziegler** operated upon a patient with copper in the vitreous nine years ago. The eye is now still absolutely free from all signs of inflammatory disturbance or other sequelae and has vision 20/40. In another case, the foreign body appeared to be imbedded in the sclera from explosion of a cartridge; there were floating opacities in the vitreous from probable hemorrhage; the fundus was hazy. In the nasal side to the far anterior and a little below the horizontal meridian, there was a large area of whitish exudate which seemed to be located in the ciliary body. The X-rays showed the foreign body.  $1\frac{1}{2} \times \frac{1}{2}$  mm., 13 mm. back of the cornea, 4 mm. below the horizontal plane, and 12 mm. to the nasal side of the vertical plane, which would make it appear that the foreign body was just outside the sclera. Vision equaled

20/100 with normal tension in each eye. An exploratory operation was performed; careful examination of the sclera and tissues outside of the eye failed to show any foreign body protruding from the globe, nor was there any metal located in the surrounding structures. The wound was closed, another X-ray photograph showed that the foreign body had not been disturbed. As the body was evidently located in the scleral tissue, it was allowed to remain and the patient kept under observation. The swollen area in the fundus over the site of the foreign body has greatly subsided and become somewhat atrophic. There has not been any inflammatory disturbance; the corrected vision equals 20/50.

In **McMullen's** case the left eye was struck by a fragment of steel. A year later vision equaled 6/60 to 6/36; slight ciliary and conjunctival congestion; iris changed in color; pupil slightly irregular, and almost inactive, vitreous opacities. A flake of metal, 4x2 mm., localized 4 mm. behind, 8 mm. below, and 8 mm. external to center of cornea, was extracted by Haab's magnet, and iridectomy required by the fragment's becoming entangled in the iris. Eleven months after operation, vision was fingers at 1 foot; the iris showed characteristic rusty discoloration, vitreous opacities, retina detached below; details of fundus blurred; no inflammation and no pain.

**Bane** reports a case where the patient felt something strike the left eye, but was not certain whether it hit the lid or eyeball. There was no pain, no sensation of a foreign body in the eye, but merely a slight discoloration of the conjunctiva on the temporal side. Vision good in each eye. Ophthalmoscopic and sideroscopic examination were negative at this time, and it was difficult to believe that there was any foreign body in the eyeball. The X-rays however showed a minute foreign body 11 mm. back of, 7 mm. below and 5 mm. to the temporal side of the center of the cornea. Another sideroscopic examination was now weakly positive, showing the same to

be a fragment of steel. Two weeks after the injury the foreign body was removed with the hand electro-magnet thru a scleral incision, resulting in excellent vision.

In **McKeown's** case of steel in the vitreous, with cataract following and the lens twice needed (See Y. B. v. 13, p. 353), the vision has now reached 20/30 after removal of the steel from the vitreous with the giant magnet. The steel had remained in the eye two years. The reporter desired to remove the steel long before but the patient would not consent.

**Haas** reports a case of slight injury to the eye received twelve years ago which attracted hardly any attention at the time; six months later the vision began to fail. At present the iris is atrophic, the lens absorbed, leaving its capsule thick and of a brownish color, the vision almost nil. Examination with a sideroscope gave a positive result, but the magnet did not attract the foreign body at once. After ablation of the capsule, the magnet showing a magnetic field, a tip of soft iron, introduced into the vitreous chamber, removed a small piece of iron covered with rust.

**Shackleton** analyzes 35 cases of intraocular foreign bodies from his own experience. In 15 the foreign body was in the vitreous, in 2 in the lens, in 4 in the anterior chamber, and 1 in the posterior chamber; in 4 cases it was entangled in the iris, and in 5 it was lodged in the ciliary body; in the remainder the site was not mentioned. There was traumatic cataract in 6 cases; in 6 cases it became necessary to remove the globe. As to the route of removal of the foreign body, in 23 it was removed thru the original wound in the cornea, and in 4 thru that in the sclera, while in 5 cases a new opening was made in the cornea, and in 3 in the sclera; the length of time of residence in the eyeball varied from 1 hour to 22 months. Of the 35 cases, useful vision was retained in 17, with an average of better than 6/7.5. The writer's experience in these cases convinces him that the anterior route will as a rule yield the best result; in no case in



which the original scleral wound is not open, would he choose the scleral route unless the foreign body could not be brought into the anterior chamber after prolonged effort.

**Griffith** observed a soldier who had had one eye removed for injury from shrapnel, and the other eye showed a piece of metal just below the macula; vision less than 6/60 and J. 16. The eye was quiet without reaction of any kind; the piece had been in the eye for over two months. It was thought best not to interfere. The galvanometer afterwards showed the metal to be non-magnetic.

**Hertel** has observed 242 intraocular foreign bodies during the present war, of which 60 per cent were of steel; the others of copper, brass, powder, stone, wood, straw or glass. Almost all of these cases appeared to be caused by explosions, as shown by multiple lesions of the face, involvement of both eyes (21 per cent), multiple ocular fragments. The force of the explosion provokes extensive intraocular hemorrhages; very small bits (2 mg.) penetrate as far as the posterior hemisphere; the foreign body may penetrate the lid and frequently detaches splinters of bone from the orbital margin. Double perforations are common. Radiography and the sideroscope are indispensable for the diagnosis; metallic fragments of less than 3 mg. fail to show by radiography; Hertel's sideroscope reveals metallic fragments of 2 mg. In case of multiple fragments or double perforation, both methods may fail.

Extraction is performed as in civil practice with the electro-magnet; but while the failures are 8 per cent in the latter, they amount to 30 per cent in military surgery. Intervention is more tardy, force of penetration greater, double perforation more frequent. The fragments from grenades are irregular in shape, toothed and often consist of alloys into which enter phosphorous, nitrogen, manganese; they are attracted with much greater difficulty by the magnet than the bits of steel commonly dealt with in civil practice. These alloys hasten the occurrence of

siderosis; in one preparation, the latter was distinctly apparent the 24th day, in another, siderosis of the choroid could be perceived.

In several cases copper and brass were extracted but half of these cases were followed by loss of the eye from infection, detachment of the retina or the presence of other fragments more deeply situated. Bits of stone were removed from the anterior chamber and upon two occasions from the deeper portion with preservation of the eyeball. In some cases fragments imperfectly localized as well as powder were well borne by the eye. Glass was almost uniformly infected in every case. In a single instance only was a piece of spectacle lens removed with a successful result. Straw and wood were removed only from the anterior chamber and never from the deeper parts. One preparation shows a piece of straw and an infection by the *b. subtilis*; another numerous giant cells about a fragment of wood. The difficulties of treatment demand early removal of these cases to a well organized ophthalmic service.

**Terrien** while agreeing with the common opinion that metallic bodies known to be in the eye should be extracted at once (preferably by the anterior route), calls attention to the well known fact that occasionally the foreign body may not only be tolerated but its presence be compatible with relatively good vision; and that while tardy extraction may be subject to many difficulties, even large bodies have been removed several months after penetration, and that one would not entertain the idea of exposing to all the dangers of extraction, an eye possessing good visual acuity. He reports five observations of foreign bodies within the eyeball, shown by radiography or the ophthalmoscope, well tolerated, causing no pain and with relatively excellent visual acuity. He thinks that such cases deserve attention; they may be more numerous than is generally believed. He could add to the number from his experience where the foreign body was perfectly well tolerated although the vision had

been lost thru detachment of the retina from the original injury.

In the case of small nonmagnetizable foreign bodies lodged in the anterior chamber, **Koster** warns, that no attempt must be made to extract thru a straight incision, and that surgical forceps must not be used to seize them; a pair of fine but strong anatomic pincers is the proper instrument. The opening by which the foreign body entered must be enlarged; or, better yet, a new angular opening made to form a flap that can be lifted up with a sharp hook. The Graefe knife is the instrument to use and it may be advisable to make a third incision to get a square flap, aiming to have the base of the flap on the side of the limbus; a flap injures the eye less than groping around thru a straight incision. Even if extraction fails the first time, it is better to try again than to advise enucleation.

For a very small splinter of metal, when the wound of entrance has already closed, an incision should be made in a radial direction at the extreme periphery, cutting around the edges with a Graefe knife; the scleral tip of the incision is then pressed down with the hand magnet which brings the scrap of metal into view. With other technic the scrap is liable to be held back by iris tissue; even a strong magnet is unable to extricate it then. The mistake is often made of making the incision too much in the cornea, by using some other instrument than the Graefe knife. The smaller the particle the harder it is to remove as a rule.

In **Smith's** case the cornea was lacerated by a splinter of wood; the foreign body had penetrated the lens causing it to become cataractous; there was also a cut of the iris with an anterior synechia. Forty-eight hours after the accident, the lens began to swell, so that iridectomy and extraction of the cataract were performed; when the lens

was removed, an eyelash was found driven thru its center; the hair could be moved to and fro in its tunnel-like opening; the lash had evidently been carried into the eye by the wood.

**Begle** discusses the effects of cilia in the anterior chamber and reports three instances, in all of which the causative traumatism was so severe as to mask the part played by the cilia, altho an exudate had taken place about the cilia in two of the cases, and a bleb-like swelling of the epithelium about the corneal wound containing the base of the cilium in the third.

**Distler** observed injury of the cornea with transplantation of two eyelashes into the anterior chamber, where they remained visible after healing; one rested on the lower margin of the pupil, the other upon the inner lower surface of the iris near the angle of the chamber.

**Leoz Ortin** reports a case brought to his attention on account of a papillomatous growth at the upper margin of the cornea. A hard mass was felt in the orbit, and from it he removed a piece of wood 38 mm. in length and 12 mm. in diameter, which had been in the orbit for eight months.

LOCALIZATION OF FOREIGN BODIES.—**Belot** and **Fraudet** insist upon the advantages of rapid radioscopy; and of radiography in five positions, according to a geometric system they have invented. With this system they were able to locate minute scraps even of aluminum, stone or glass; in one instance a particle of the latter substance 1 mm. long by  $\frac{1}{2}$  mm. wide and thick was accurately determined. With their system all that is required for exact localization is to outline a curve, and draw the outline on transparent paper placed over the five radiographs in turn; the tracing thus obtained locates the foreign body with precision.

*(To be continued)*



# DIGEST OF THE LITERATURE.

## INJURIES.

THEODORE B. SCHNEIDEMAN, M. D., F. A. C. S.

PHILADELPHIA, PA.

(Continued from October issue)

**Eaton** writes a lengthy paper with 23 illustrations, a number of mathematical formulae and 4 tables, upon the determination of position of foreign bodies in the eyeball; the paper should be consulted in the original. **Edwards** employs and describes Sweet's method of localizing foreign bodies. **Adam** believes that stereoscopic radioscopy possesses not only the advantage of greatly facilitating orientation, especially in wounds of the head and localization of the shadows, but also, by superposition of the images, making the shadows much more intense and well defined than simple radiography. He explains the technic and shows how with the usual apparatus the procedure is readily carried out; a special chamber and screen are the only necessary adjuncts.

**Coleman** advocates removal of foreign bodies from the vitreous by the scleral route; he endorses the movable magnet (sideroscope) and X-rays for the detection of magnetizable bodies within the eye; the former, when positive, may suggest exposure of the plate at an unusual angle when a foreign body which has failed to show upon the plate in the usual exposure, will appear. He refers to a case in illustration.

**Whitehead** refers to the subject of localization of foreign bodies, especially such as are magnetic. In some cases the body can be seen by direct inspection, in others localization is assisted by noting the point of penetration, and where present, the corresponding wound of the iris or lens. Where the penetration has been behind the lens, the foreign body can sometimes be seen with the ophthalmoscope. The sideroscope may detect its pres-

ence. The X-rays are the most valuable method of all. The telephone probe would not be of much assistance in the eyeball itself, but it might be of great value in the orbit.

**Crigler** observed a case of steel in the vitreous with retention of useful vision (20/30) and no inflammatory symptoms and without siderosis. The X-rays located the foreign body, 1x3 mm., near the posterior margin of the ciliary body. Removal of the foreign body was advised but refused. The body was not detected by the physician who attended the patient immediately after the injury.

**Dor** reports eight observations of undiscovered intraocular foreign bodies. One of the cases had been examined by three specialists and another by five. The symptoms were those of acute inflammatory glaucoma, intraocular infection or traumatic cataract. The point of entrance was in the sclera in every case, so that after a few days it was no longer discernible. The X-rays always revealed the foreign body.

In **Pontius'** case, the sclera had been struck by a shot from an air rifle about 10 mm. to the outer side of the cornea. Twenty-four hours after the accident, nothing was noted but the external injury to the sclera which showed as a circular area of hemorrhage 2 mm. in diameter; 8 days later this area began to bulge. The fundus at present shows a patch of choroiditis beneath the site of the scleral wound, the surrounding choroid presents some deep effusion and is slightly elevated; there is, however, no retinal detachment. The disc presents slight early changes of optic neuritis.

**MAGNET OPERATIONS.**—**Butler** describes the *ring-magnet* introduced by

Prof. Mellinger of Basle. In this form the lines of force lie parallel and do not diverge as in the ordinary magnet; in consequence, the tractive force is great along the central axis at right angles to the plane of the ring, outside of which the force rapidly falls off. The advantages of this instrument as against the ordinary pattern are believed by the writer to be so great as to completely outclass the older instruments. In every case of steel in the eye, where the ring magnet failed, he has employed the Haab; in no single instance has the Haab removed the foreign body under these conditions.

The advantages of the ring magnet may be summarized as follows: (1) The operation can be performed with the patient lying upon the table. (2) The patient need not be moved when the splinter has appeared in the anterior chamber. (3) There is no necessity for using a hand magnet. (4) The power of the ring magnet at its center is great, and is under absolute control. (5) It is much easier to operate with the rods upon a motionless patient, than to have to move the head this way and that before the giant magnet. (6) A patient sitting before the giant magnet may experience pain and move at the critical moment. The only valid objection to the ring magnet is, that as the force is considerable only at the center of the solenoid, the eye must be kept in the center, but as to this, there is no difficulty in placing the eye in this situation and keeping it there. The author has succeeded in removing pieces of steel from the cornea which were difficult to extract with a needle.

**Bartels** has written on the use of the magnet for ocular injuries in the field. **Le Roy Thompson** reports six cases of eye injury with penetration of foreign body, all of which resisted the magnet, and the eyes were enucleated. The pieces of metal were embedded in the sclera. **Campbell** reports a case of foreign body which also resisted the magnet, and the eye was enucleated. He points out that this failure of removal of the foreign body is an absolute indication for enucleation. **Claiborne** reports three cases in which magnet ex-

traction was attempted, but in only one of which it was successful. **Kelsall** reports two cases of successful extraction with the small magnet. In one of them the Haab magnet had previously failed to give any result.

As against Haab's assumption that most foreign bodies are spindle shaped and smooth, **Pooley's** experience is that they are more frequently irregularly triangular flakes with sharp angles, much inclined to turn broadside on when they meet any resistance. When the foreign bodies are situated in or behind the lens, his rules are: Not to make any attempt to remove the foreign body before its situation has been carefully localized; a few days' delay makes no difference in the result; do not use a trial pull, nor pull on the ciliary body; the foreign body should be removed from the nearest point; no attempt should be made to remove a foreign body imbedded in the choroid. His present practice is as follows: 1. If the lens is badly wounded so that it must become opaque and swell, and the foreign body is situated immediately behind it, he removes the lens and then the foreign body by pulling it into the anterior chamber. 2. If the lens is intact or but slightly wounded, or for other reasons it is not desirable to remove the lens, and the foreign body is situated behind it, he removes the foreign body thru an incision behind the ciliary body, usually behind the insertion of the extrinsic muscles. The advantages of a scleral route are: 1. The operation is easier and there is no resistance to the passage of the foreign body; the vitreous is but little disturbed. 2. The inflammatory exudate may even come away with the foreign body. 3. The ciliary segment is not bruised. 4. A sutured conjunctival wound is much less liable to late infection than a corneal wound. The disadvantages of the scleral route are: Impaction of the choroid, retina and vitreous in the wound; but this very rarely occurs. He claims the following special advantages: 1. A large percentage of eyes is saved. 2. Better visual acuity. 3. Shorter period of convalescence.



**Whiting and Goulden** give a minute and detailed exposition for the extraction of magnetic foreign bodies from the eye. Some idea of the number of their cases will be gathered from the fact that in one month they removed magnetic foreign bodies from within the globes in 30 cases; in one day 5 such cases were operated upon and more recently 13 in one week. All these occurred during the past 12 months in the military hospital to which they were attached. The object of their paper is to give a detailed description of the use of the Haab and small magnets in combination—of which combined method the details have not been published. The paper should be consulted in the original.

**Lamb** presents the arguments in favor of, and against, the anterior chamber and scleral routes respectively in the magnet operation. He cites authorities with reports of final results for each method. He concludes that it is best to evade any definite statement, and that the method of extraction should be adapted to the individual case. Both the large and small magnets should be in the oculist's armamentarium—as conceded by both **Hirschberg** and **Haab**.

**Calhoun** details three illustrative cases of removal of metallic bodies from the eye with the magnet. He lays down the following deductions: (1) The advantage of immediate attention. (2) The necessity of X-ray localization. (3) The anterior route is the one of choice for extraction, although scleral incision is occasionally necessary; and only as a last resort should the tip of the magnet be introduced into the vitreous chamber.

**Higbee** argues in favor of the scleral route for removal of foreign bodies as being much simpler than the anterior chamber route; he thinks fewer complications are met with. Of 200 personal cases the vision was 20/20 in 42, 20/40 in 49, useful vision in 76, no vision but eyeball retained in 20, detachment in 8, enucleation in 5,—a record which will certainly bear comparison with that of any other method.

**Gibson and Pockley** have written on magnet extraction. **Van der Hoeve** urges the importance of prompt removal of bits of iron from within the eye. He reports two cases, in one of which there had been no trouble from a piece of iron embedded in the iris for seven years. Then symptoms of siderosis developed.

**GUNSHOT WOUNDS OF EYEBALL AND ORBIT.**—**Rollet** and **Velter** observed, of 3,915 wounded, 343 instances of lesions of the deep coats of the eye without disorganization of the eyeball, a percentage of 8.76. Lesions produced by intraocular bodies, cases in which the vitreous is filled with blood and wounds of the anterior segment of the globe are excluded. In 145 cases the impact of the projectile was directly upon the eyeball; in 128 the impact was upon adjoining structures, particularly the outer portion of the orbit. The writers grouped their cases under the following headings: 1st, detachment of retina, 43 cases; 2nd, detachment with exudation, resulting in proliferating retinitis or cicatricial bands, 37 cases; 3rd, rupture of the choroid, 133 cases; extremely variable in extent and position; 4th, choroidoretinal hemorrhages and resulting changes, 130 cases, of which 38 were in the macular region; 5th, concomitant lesions of the papilla from simple hyperemia to atrophy. The prognosis is naturally uncertain; where the macula has not been irremediably damaged, a considerable degree of vision may be regained after the lapse of a considerable period.

**Orendorff** reports a case in which a bullet was removed from the orbit after being embedded there for ten years. (*A. J. O.*, v. 1, p. 113.)

**Harris** reports and illustrates with skiagrams a case in which a bullet appears to have entered by the left inner canthus, and to have passed along between the eyeball and inner wall of the orbit, until it reached the apex of that cavity, then turning downwards, inwards, and forwards, it described an angle of more than 180 degrees, and entered the sphenoidal sinus, wounding in its course the third and optic nerves;

ptosis and left optic atrophy followed. The bullet was successfully removed.

In **Birch-Hirschfeld's** case, a soldier was injured by a rifle shot. He was unconscious for quite a time, and after recovery, the right eye was found to be blind. Four months later, the reporter found a scar at the wound of entrance in the middle of the forehead, above the root of the nose. The point of exit was on the right side of the neck between the right inframaxillary angle and the insertion of the sternocleidomastoid muscle. The right eye and its surroundings showed no external changes; it deviated a little outward; the pupil was enlarged and reacted slightly to light; motility was somewhat impaired; vision equalled fingers at 1 meter eccentrically. As the vitreous was only slightly opaque a good ophthalmoscopic view was obtained; the disc appeared to be separated into two parts vertically; both parts had a reddish color from each of which numerous arteries and veins emerged which could be traced far into the retina. The separating surface was covered by a grayish white new formation projecting into the vitreous; there was an extensive chorio-retinitic focus with pigment and grayish white patches; the retina was detached upon the temporal quadrant. Oblique laceration of the optic disc and a gaping wound of the sclera was diagnosed. An unusual feature of the case was the fact that the optic nerve did not become totally atrophic and that the central artery of the retina was not severed also.

**WOUNDS OF TRACTS AND CENTERS.**—**Velter** has published a very complete study and analysis of the cases he observed from September, 1914, to November, 1915, in a service of cranial surgery in a first line military hospital. Grouping the cases studied, the writer believes that an anatomic classification is the only rational plan, being rendered possible by the principle that surgical exploration is indicated in all wounds of the head, even if apparently unimportant. He divides the cases into 5 groups: (1) Cranio-cerebral penetrating wounds with extensive traumatism; patients moribund. (2) Pen-

etrating wounds of the cranium without puncture of the dura. (3) Penetrating cranio-facial wounds. (4) Tangential wounds. (5) Penetrating cranio-cerebral wounds properly so called: (a) with occipital lesions and visual disturbances; (b) with lesions of other regions of the encephalon; (c) with deeply penetrating projectile.

In addition to detailing the nervous and general symptoms, the writer insists upon the frequency and importance of precocious ocular disturbances, which latter are so generally neglected by surgeons in wounds of the cranium; it is indispensable to recognize and search for these however, for they invariably give valuable indications and require in many cases appropriate treatment. **Velter** describes the various disturbances of vision which he has noted. Motor involvement consists of paralysis of ocular muscles. Pupillary lesions are quite frequent; mydriasis occurs in all cases of extensive lesions of the cranium and encephalon, which rapidly tend to a fatal issue; giving place to miosis when lesions of the deeper part are present which bleed freely and are recognizable by intense contractures and convulsions. When the membranes are intact, mydriasis is exceptional. Modifications of the pupillary reflexes are very rare. The writer has encountered only three cases of papillitis or papillary stasis.

He records four instances of hemianopsia in occipital lesions; in five cases without hemianopsia he has noted narrowing of the visual fields; such contraction of the field in the absence of any ocular and papillary lesion is extremely persistent and forms part of a late syndrome of penetrating wounds of the brain, its pathogeny is unknown. In a final chapter the author describes the late accidents of penetrating wounds of the cranium and gives a resumé of the indications for cranioplasty. For personal statistics, of 19 cases of penetrating wounds not trephined, 18 were fatal. Of 62 cases trephined 10 were fatal; operative mortality 16.1 per cent.

**Evans** details the histories of five cases of intracranial injuries. In one



the subdural hemorrhage was on the side opposite the choked disc, and in another on the same side—thus demonstrating the value of choked disc in the diagnosis of so-called closed cranial injuries with intracranial tension.

**Löwenstein and Neuhaus** report of 57 injuries of the skull, 32 showing inflammation or choking of the optic disc. In 23 skull injuries, the paralysis continued until recovery or death, excepting in one case, while the paralysis recovered in 6 cases which presented a normal optic nerve, thus indicating that changes of the disc are of bad prognosis in injuries of the skull. Of 32 cases showing such changes, 26 were infected and 6 not; in the latter the dura was intact with increased intradural pressure; in the 26 remaining cases the dura had been opened. The various consequences of skull injuries, such as increase of intracranial pressure, suppuration of exposed parts of the brain when the dura is opened, all cause changes of the optic disc which can be observed with the ophthalmoscope.

In **McHenry's** case of a man aged 74, following a shot beneath the left eye, blinding the same, complete right sided hemiplegia without aphasia occurred; with beginning signs of medullary compression as evidenced by lowered pulse rate, rise in temperature and diminished respiration. The cerebro-spinal fluid was under pressure, as shown by lumbar puncture and ophthalmoscopic findings (obscuration of the optic disc of the right eye). The combined symptoms and signs of hemorrhage in the brain, together with other clinical signs, were also positive. Cranial decompression operation was performed on the left side, which released a quantity of free dark blood, subdural. Complete recovery ensued; the left eye remaining totally blind without impairment of vision of the right eye.

**Roche** has collected histories of 11 cases of paralysis of the *cervical sympathetic* following wounds received in war; 4 were personal and hitherto unpublished. He tabulates them showing which of the signs of sympathetic

paralysis were present in each case. These signs are: Miosis, ptosis, enophthalmos, ocular hypotony, secretory disturbance, vasomotor disturbance. Not one of the 11 cases showed the complete syndrome—known as the Claude Bernard-Horner syndrome. Miosis was present in every case; enophthalmos in 10; vasomotor disturbance in 6; ptosis in 4; no case showed hypotony. The writer points out that it is impossible to state certainly which ganglion or branches of the sympathetic have been wounded. He suggests that the variation in the clinical features may depend upon the situation of the injury.

**BIRTH INJURY.**—In **Monaghan's** case, a child of five, there was a history of forceps delivery with a contusion over the left eye. The eye was blood shot for three months and has squinted. The lens of the left eye is now cataractous and that of the right cloudy.

**Friedenwald** saw a child one and a quarter hours after birth with the left eyeball completely luxated. After unsuccessful efforts to reduce it an incision was made at the outer canthus and then reduction was easy. Apparently no permanent harm resulted from the accident. (*A. J. O.*, v. 1, p. 9.)

**GENERAL PAPERS.**—**Wessely's** manual is intended for the general practitioner, especially the ambulance surgeon; it is a kind of "first aid surgery" for the eye. The author notes the increase in the proportion of wounds of the eye in the present war. According to his statistics, 30 per cent of wounded eyes retain useful vision. Foreign bodies of the cornea and conjunctiva are sometimes very numerous; they should be removed carefully to avoid extensive opacities. As regards lesions from shell shock, i. e. commotion of the retina, he emphasizes the disturbance of "Berlin." The entire retina is discolored, whitish; the vision is almost lost, but the prognosis is good. In complete destruction of the eyeball, enucleation is advised and not evisceration on account of the dangers of sympathetic ophthalmia. But there should be no haste, for this

complication does not occur before the fourteenth day. If the eye can be preserved, prolapsing membranes should be resected, the sclera and cornea sutured and covered by conjunctiva.

Foreign bodies should be removed by the electromagnet. The author has devised a glass shell rich in lead which shows to radiography; applied to the eye, it serves to localize foreign bodies. He recommends the sideroscope, and insists upon the gravity of foreign bodies allowed to remain (sympathetic ophthalmia, atrophy). He considers the extraction of nonmagnetic foreign bodies, advises waiting at least 6 months or even a year before operating upon traumatic cataracts on account of the danger of hyalitis or cyclitis. He speaks at length of sympathetic ophthalmia, thinks that the period of danger extends from the fourth to the tenth week, notes the low incidence of this complication in the present war (8 cases in the German Army), a circumstance which he attributes to early preventive enucleation to be performed whenever an eye can not be preserved. Sympathetic ophthalmia rarely follows enucleation.

*Orbital lesions:* the writer studies wounds tangential, sagittal, usually fatal perforation of both globes (rare 1/100 of all ocular lesions), section of the optic nerve, of the ciliary vessels, muscles, rupture of the choroid and retina, retinitis proliferans, ("sclopetaria") lesions of the chorio-retina from concussion. He discusses extraction of projectiles from the orbit; infection is rare even with fragments of grenades; the indications for removal should be based upon the size, form, seat, radiography. Shrapnel from its chemical composition occasionally excites a mild inflammation; extraction should be performed if possible, but small particles lying deep in the orbit should be left. Indirect lesions of the orbit: traumatic exophthalmia and anophthalmia, fractures extending from the base, habitually fatal, lesions of the optic nerve at the foramen, hemorrhage into the sheaths, pulsating exophthalmia, luxation of the globe, traumatic

anophthalmia with fracture of the orbit.

The final chapter is devoted to the fundus; papillary stasis is a sign of hypertension, neuritis of intracranial inflammation. It is frequently impossible to make the distinction with the ophthalmoscope. These symptoms are present in one-half of the wounds of the cranium. The papillary changes are more marked upon the side of the lesion; the site of the wound has little influence. Following intervention, in favorable cases, the papilla resumes its normal appearance. If stasis persists, associated with other symptoms of hypertension, operation is indicated. Late appearance or return of stasis is of grave prognosis; the ophthalmoscopic appearance alone should only be decisive in exceptional cases in regard to intervention, but it is an important element. The author concludes that in every case of wound of the cranium, if the condition of the patient permits, not only should the ophthalmoscope be used, but examination into function should be made as well, including visual field, visual acuity and light sense.

**Von Szily's** *Atlas of War Ophthalmology* contains an extensive review of the literature as well as the personal experience of the writer. It is impossible to give a satisfactory review in a reasonable space. The subjects considered come under several heads with which they are naturally associated: these are ocular lesions in wounds of the cranium; wounds of the temporal wall of the orbit from fire-arms; hemianopsia in war; penetrating wounds of the orbit and its neighborhood; extensive destructive lesions. The work as a whole is characterized by a French reviewer as "conscientious but without originality."

**Giuseppe** calls attention to the exceptional frequency in this war of wounds of the head and eyes. In mountain warfare scraps of stone broken off and propelled by explosions increase the danger for the eyes. Another danger is trachoma and other eye affections from prisoners, and from such infections in the trenches just vacated by the enemy. The toxic lacri-



mating gases are far less dangerous for the eyes than the usual asphyxiating gases; the latter, when they act upon the eyes long enough, render the cornea insensible. If the injury is severe small foci of necrosis develop, with violent pain, leading to complete destruction of the eyeball. In this writer's experience, 16 per cent of the war injuries of the eyes were from machine guns or shrapnel, 50 per cent from flying scraps of stone, 5 per cent from trachoma, and 25 per cent from asphyxiating gases.

**INDUSTRIAL INJURIES.**—**Posey** refers to the large number of injured eyes from industrial injuries in the United States. Of two million nonfatal accidents, probably 160,000 are accidents to the eyes. Of 100,000 blind in this country, approximately 10,000 lost their sight as the result of accidental injury in industrial occupations. Of the ordinary menaces to the eye the most common are: Burns from molten metal, "chipping" of metal surfaces, explosion of gauges, emery wheels, the breaking of particles of metal from the head of damaged tools (mushroomed), blasting from premature or delayed explosions, exposure to excessive heat and light and inadequate illumination of work rooms.

Among preventives for minimizing these dangers are, education of employes and proper first aid to the injured, which should consist in the application of a protective bandage and the prohibition on the part of fellow workmen to remove foreign bodies with dirty instruments, occupy a prominent place. Protective goggles are indispensable in exposed occupations. The apparent danger of injury to the eye from breaking of the goggles is not well founded. Such goggles have proved their worth in reducing the number of injuries to the eyes wherever they have been used. A special form of goggles is necessary when the eyes are exposed to intense heat and light rays. Those suggested by Prof. Pfund of Johns Hopkins University promise best. These are made by coating a flat piece of Crookes or other similar glass, with an extremely thin

layer of 22 kt. gold, the latter being protected by a flat piece of hard white crown glass.

The Bureau of Standards in Washington has been making spectrophotometric examinations to determine the transmissibility of ultraviolet, visible, and infrared rays, and the results may be expected to lead to valuable information in regard to the kind and color of glass to be employed.

**Würdemann** has written the section on occupational injuries and diseases of the eye for Kober and Hanson's *Diseases of Occupation and Vocational Hygiene*. **Barkan** has written on common ocular injuries from industrial accidents.

**WAR INJURIES AND THEIR REPAIR.**—**Duverger** writes an extensive paper upon two months' experience in an ophthalmic hospital for wounded soldiers. He emphasizes two important points which his experience amply corroborates: 1st, the necessity of an oculist near the front in all large centers for wounded soldiers. 2nd, all wounds of the orbital region and of the globe should immediately receive every necessary operative attention; to render this possible, medical units at the front should be provided with a complete outfit.

Without dwelling upon statistics, which it is not his intention to give, he refers to the large number of wounded which came under his care during the two months. In a single day, following an attack, he noted 11 penetrating wounds of the globe and some 30 different palpebro-orbital lesions. Upon the same day a total of 725 wounded were cared for at the hospital.

A detailed review of this paper cannot be given here: a circumstance strongly emphasized is the necessity of careful and exhaustive examination of every case of wound of the eye and adjacent parts, however trivial in appearance; particularly the necessity of determining the question by all means at our command, whether or not the eye harbors a foreign body. Like so many papers which deal with the surgery of the present war from the pens

of the surgeons who are actively engaged, this communication is replete with interesting observations and conclusions. A critical analysis of such work as a whole must be left to a subsequent time of greater leisure.

**Bourdier** finds that the percentage of eye lesions have increased from 1-1.5 to 5.7 per cent with trench warfare. Next to contusions, penetrating wounds are the most frequent—of 633 ocular lesions, 174 were perforations, about 26 per cent. According to **Genet's** statistics 6 per cent of ocular traumatisms lose both eyes. **Petit** estimates that it is possible to preserve the globe in 26 to 74 per cent of the cases. **Cosmetatos** reports of 118 cases in the Greco-Turko-Bulgarian war there were 29 of complete destruction of both eyes, 17 unilateral. Sympathetic ophthalmia seems to be less frequent now than formerly.

**Terrien** presents a contribution, based upon a large experience of wounds of the eyelid and orbit in war. He discusses the advantages of the different kinds of flap which he has employed: sliding flap, flap with pedicle, and cutaneous and conjunctival grafts. He appears to favor pedunculated flaps from the immediate vicinity of the eyelids, whenever possible. But in cases of extensive wounds or cicatrices for which larger flaps are necessary, he has employed the Italian method and has taken a flap from the arm liberating it from the pedicle about the twelfth day. For total symblepharon he has employed skin grafts, taken from situations where the skin is thin, as the inner surface of the arm, or behind the ear; they should be free from subcutaneous cellular tissue. The adherent lid having been detached in its whole length and breadth from the orbital cavity (presumably where the globe has been destroyed), and a cul-de-sac constructed, the flap, measuring about one-quarter more than the prepared area, is very carefully sutured into place. The reporter has some fear of late shrinking of these flaps, and when possible prefers a pedicle flap from the temporal region.

**Morax and Désauges**, among 1,510 wounded soldiers, under their care from September, 1914, till 1917, observed 22 instances of traumatic lesions of the lacrimal passages—13 from rifle bullets and 9 from shells and torpedoes. The lesion may be caused by direct injury of the lacrimal passages with or without fracture of the lacrimal bone or superior maxilla or indirectly from secondary involvement due to fracture of the latter bone.

It is exceptional for the lacrimal lesion to occur alone; the presence of other disturbances or lesions almost invariably brings it about that involvement of the lacrimal passages is unrecognized or neglected at first. The latter shows itself only by slight watering. Subsequent infection calls attention to the injury. The frequency of infection is very great—19 out of 22. It consists of a dacryocystitis with or without abscess. The time of the occurrence of this complication is very inconstant—in these cases in from 1 to 18 months after the wound. Such tardy complications are comparable to what is sometimes observed in fractures of the bones of the face or of the base of the cranium when the sinuses are involved.

Treatment of these traumatic lesions and their complications is beset with great difficulty; it is almost always impossible to reestablish permeability of the canal; extirpation of the sac is the only measure to arrest suppuration. In spite of the best applied treatment relapses are frequent; this is particularly the case when the mucous membrane of the sac has been lacerated, and when there is no longer a single cavity, but a number of diverticuli. It is only by minute dissection of the canaliculi, of the different portions of the mucous lining of the sac and duct, as far as the stricture, that it is possible to succeed in arresting the source of these very disturbing suppurations, even where the globe has been enucleated.

**Kuhnt** writes that in cicatricial ectropion resulting from injury in war, the incision should be made if possible 1 cm. from the palpebral margin; cicatricial tissue should be entirely re-



moved. In the case of the lower lid the loss of substance should be covered by a pedicled flap from the temple, in the upper lid with a nonpedicled cutaneous flap. The pedicled flap should be carefully fixed in the central portion, so as to form a slight swelling above the level of the surrounding tissues. The writer gives special directions for fitting the extremity of the flap into the internal angle. Tarsal coloboma not over 1 cm. in width may be repaired by direct union. In case the entire width of the lid is involved, the anterior layer should be separated from the tarso-orbital fascia as far as the border of the orbit, and sutures placed in rows after displacing toward the nose the external flap, wherever there is considerable loss of substance.

In cicatrices adherent to the bone the cicatricial mass should be carefully removed, the palpebral border shortened and a fatty graft inserted, and the lid supported as far as possible by a suture. For restoration of the entire lid, Kuhnt adds to Fricke's method, flaps with two pedicles taken from the lid and cheek; in case of the upper lid he makes the transplantation from the lower one. In symblepharon, to cover the loss of bulbar tissue, he makes a

bridge shaped flap, or covers it with conjunctiva; in some cases, he takes conjunctiva from the other eye or a bit of mucous membrane from the mouth.

To replace the palpebral conjunctiva he takes a pedicled flap from the cheek, or skin from the lower lid, or buccal mucous membrane or conjunctiva from the other eye. In case of anophthalmia, he recommends May's procedure, but he also employs that of Czermak and Grunert. In cicatricial depression of the internal or external canthus, the lid is divided at the orbital margin, the periosteum stripped off for two or three mm. in area, the orbital contents brought forward and solidly fixed. Finally he gives directions for the closure of extensive naso-orbital openings, the restoration of loss of substance at the orbital margin, and the method of filling the cavity of the orbit.

Krusius describes his technic of dealing with the conjunctival plastic of the cornea, sclera; and a method of evisceration of the eyeball with retention of the cornea. The immediate results in the prevention of infection were excellent as well as for rendering the wounded man fit for transportation.

## GENERAL PATHOLOGY.

HANS BARKAN, M. D.

SAN FRANCISCO, CALIFORNIA.

This section notices general theoretic and experimental studies of the subject, covering the literature from January, 1917, to September, 1918.

**HEREDITY IN EYE CONDITIONS.**—Stören, Ewart and Howe have all published articles on the general subject of the influence sex, growth, and age of parent have on hereditary eye diseases, and on the transmission of the pigmentation of eyes. Stören examined the color of the eyes of individuals of the same sex in three consecutive generations. In 7 families in which both parents had brown eyes, 5 boys had blue, 17 boys had brown, 6 girls had blue, and 10 girls had brown eyes. In

families in which both parents had blue eyes, in quite a series of cases children with brown eyes were not infrequent, although in 1 case both parents and all 4 grandfathers and grandmothers had blue eyes. Stören concludes that there is no constant factor in any possible hereditary transmission of eye color.

Ewart has collected with great care a large number of statistics in an attempt to find a hereditary factor concerning eye color. In this relation the

influence of the age of the parent at the birth of the child was one of the factors studied. The material was collected in Middlesborough and consisted of females only. He selected as the standard the number of blue eyed in groups of different ages, and examined 1,000 eyes at birth finding the blue percentage 100. In the sixth year, of 387 the blue percentage was 54; at the ninth year, of 488 the blue was 41; between 15 and 29 of 80 examined the blue was 32, and between 31 and 40 of 543 examined the blue was 30 per cent.

The eyes of all infants are blue of varying shades at birth and change to other colors gradually. They change a little as late as the 20th to 30th year, and a distinct tendency of the eye to darken exists thruout life, irrespective of any factors that could be considered, that is, age of parent at birth, color of pigment of eyes, etc. The results of the examination, however, suggest that children born of young mothers tend to blue eyes; or at least that changes in the darker pigmentation dependent upon age are delayed in these children.

On the whole Ewart regards his results as purely negative, a number of his carefully worked out statistical series showing no association between the age of the parent at birth and the eye color of the adult. He concludes as far as the age of the parent at the birth of the child is concerned (1) that the average length of life of the offspring decreases; (2) the fertility of the offspring increases; (3) the offspring react less characteristically to zymotic infections; (4) the number of males born increases, and finally, that the intellectual grade of the offspring as defined by scholastic standards, rises.

Howe, in studying ocular muscles, has often noted that 3 or 4 persons in the same family show similar heterophorias, heterotropias, predisposition to ocular fatigue, etc. This has brought him to a study of the Mendelian law, of which he gives a very lucid explanation accompanied by a chart. He urges ophthalmologists to familiarize themselves with the simpler elements of the

law, as, for instance, the characteristics of inheritance; the terms "dominant" or "recessive" factors, claiming that in the study of certain ocular diseases, as for instance, retinitis pigmentosa, familial optic nerve atrophy, etc., the probability of the offspring being affected can be judged only by the ophthalmologist acquainted with the laws of Mendelian inheritance.

Howe raises a very interesting point in referring to another principle of heredity, namely, that of sex linkage, this being the tendency of certain characteristics to develop exclusively and predominantly in the male members of the family, as optic nerve atrophy, color blindness and night blindness. Howe urges the study of a few useful books among which he mentions Herbert's "Fundamental Principles of Heredity"; Castle's "Genetics and Eugenics"; and Davenport's "Heredity in Relation to Eugenics." The practical application of this knowledge in our specialty is stated by Howe to be illustrated by the advice we may be asked to give to persons desiring to marry, in whose family there may be a history of eye defects, such as coloboma of the iris, glaucoma, displaced lens, retinitis pigmentosa, optic nerve atrophy, etc.

**DEGENERATIVE CHANGES.** — Lewis draws attention to the ease and beauty with which ophthalmologists can see directly, and study at their leisure, pathologic changes, especially the advance of degenerative processes which occur before our very eyes. In support of his plea and in the course of an excellent review of the general subject of slow degenerative changes in the eyeball, he speaks of the formation of lime salts in an uninjured cornea and in an otherwise healthy eye, the author concluding that that particular part of the cornea had lost its vitality. In his case a solid lime deposit came away in the form of a perfect cast on probing underneath. Another interesting case quoted is that of calcareous degeneration in the deeper layers of the cornea; in which, during removal of cataract, the tissues grated during the incision as though filled with ashes. The cor-



nea was littered with small opaque spots in the deeper layers, and Lewis believes the condition to be allied to nodular opacity. Lewis proceeds to review briefly the occurrence in the eye of calcareous and osseous degenerative processes so often seen in the degenerated eyeball at microscopic examination. After an interesting discussion regarding the biology of the cell from a broad point of view, Lewis takes the physiologic chemical point of view in regarding the complexity of the degenerative changes as being the logical retrograde processes, just as in the upbuilding the complexity of these processes is as great.

**CICATRICIAL CHANGES.**—**Steyn's** paper deals with an anatomic description of cicatricial changes of the eye, especially the development of the trachomatous entropion, the occlusion of the angle of the anterior chamber and the ectropion of the pigment layer of the iris in glaucoma; and ends with a critic of the observations of Schnabel regarding the glaucomatous caverns of the optic nerve. He finally presents a theory of his own concerning the causation of retinal detachment.

**CHOLESTERIN IN THE EYE.**—**Vuse** fed rabbits with cholesterin and olive oil, the rabbits developing a high grade permanent lipemia. Very early, before any opalescence of serum takes place, an opaque ring is formed about the corneal margin, resembling in every particular the arcus senilis of the human. The ring is independent of any vascular changes and is solely an infiltration of the cornea with cholesterin fat mixtures. **Albarenque** finds the deposit of cholesterin in the eye is favored by the normal supply of this substance to the organ, the nutrition of the media dependent on the osmotic circulation, and their passive function. He traces the effects of these conditions in arcus senilis, cataract, retinitis, and xanthelasma.

**INFLUENCE OF X-RAY.**—**Pagenstecher** has investigated the question of retinal rosettes, and has shown that when pregnant rabbits were irradiated typical rosettes could afterward be demonstrated in the retina of the living fe-

tus. X-rays can therefore produce congenital rosettes of the retina in certain animals. [The reviewer speculates as to whether the rosettes found by Lilienfeld in the human embryo eyes in Axenfeld's and Fuchs' clinics, described as misplaced embryonic retinal elements and as the starting point of glioma, may not have been obtained from children whose mothers were subjected to abdominal X-ray exposure. This point has never been stated in the publication of these cases.—H. B.]

**DIFFERENTIATION OF DIPLOBACILLI.**—**Scarlett** gives the histories of two cases of corneal ulceration due to two diplobacilli resembling morphologically the *Morax diplobacillus* and the *diplobacillus* of Petit, but differing in cultural and staining characteristics. One of these Scarlett has named *diplobacillus nonliquefaciens*, as it does not liquify agar or coagulate serum. This organism causes a severe painful ulcer with hypopyon. The second organism was distinguished from other members of the group by being gram positive. A table is appended showing the characteristics of these organisms in smear and culture.

**CHEMISTRY OF OCULAR PIGMENT.**—**Lo Cascio** by painstaking chemical researches presents the chemical constituents of the choroid of the ox, stating that it contains carbon and nitrogen, and sulphur as high as 1.77 per cent, iron in 0.10 per cent which may come from a trace of blood, phosphorus in 0.24 per cent, oleaginous substances, butyric acid and xilitone. Of chief interest is his statement that the retinal pigment does not differ in its chemic composition from the choroid pigment; and that the human choroid pigment does not differ from that of the ox.

**ANAPHYLAXIS.**—An editorial in the *New York Medical Journal*, vol. 106, p. 1187, on ocular anaphylaxis, takes up briefly the main theories of sympathetic ophthalmia, stating that the explanation accepted by most observers today is that the condition is an anaphylactic uveitis. A short and clear explanation of the theory of the anaphylactic process is then given; namely, that the disintegrating uvea in

the exciting eye is reabsorbed as antigen, and leads to a hypersensitization of homologous tissue, namely uvea of the second eye. Absorption beyond this point becomes intoxication and is manifested clinically by the well known inflammatory signs. See O. Y. B., v. 13, p. 367.

**Woods**, in a second contribution on the same subject of ocular anaphylaxis discusses the theories held, up to the present; the mycotic theory, the bacterial origin, both of which he discards, and then refers to the cytotoxic theory of Golowin. This theory first brought the subject into the serologic state; and **Elschnig**, whose first work appeared in 1910, enunciated the theory of the anaphylactic origin of sympathetic ophthalmia with a report of his experimental work. There follows a clear and minute description of **Elschnig's** work and that of **Fuchs**, **Meller** and **von Szily**; all of whom worked along these lines, altho in many ways their view has been that of skepticism regarding the antigen properties of chemically pure uveal pigment.

The work undertaken by **Woods** has been with the idea of simulating as closely as possible the conditions under which sympathetic ophthalmia occurs clinically, and to this end the eyes of sensitized animals were perfused with specific antigens. The plan of work has been to determine the following points: (1) the antigenic properties of homologous uvea; (2) the ability of one eye to react to perfusion in animals previously sensitized by intraocular injection of the other eye; (3) the constituent of the uveal tract responsible for such antigenic properties as are possessed by the homologous uvea. The technic of the experiments is too detailed to be reviewed, but the discussion in **Woods' paper** leads to the following conclusions: (1) Homologous uvea has the power of acting as antigen and producing an ocular hypersensitiveness: (2) Homologous uvea possesses a strong organ specificity: (3) Intraocular injection of a small amount of either homologous or heterologous uveal emulsion can

produce a hypersensitiveness in the second eye. (4) It seems probable that the peculiar antigen properties of uveal emulsions are due to the pigment epithelium.

**ACCIDENTAL SOMATIC CHANGES.**—**Landolt** engages in a discussion and presentation of some letters between **Donders** and **Brown-Sequard** of a rather amusing character. It seems that **Brown-Sequard** in section of the restiform body in guinea pigs noted opacity of the cornea and lens in the descendants of these, as well as changes in the vitreous and aqueous consisting of white or rose colored flakes. **Donders** in a letter to **Brown-Sequard** questions the effect of the section of the restiform body; and explains the eye lesions found in these lively little animals as the result of the guinea pig running about in the cage, fighting with his neighbor and thereby injuring his eye, and also asks whether **Brown-Sequard** acted as the accoucheur of the guinea pigs and could be positive that they were really born with these defects. **Brown-Sequard** in answer stated that all of these lesions came from one pair of guinea pigs that had been operated upon. With our present knowledge of heredity, eye defects and close mating in the production of a chain of eye defects, it appears probable to the reviewer that section of the restiform body in this particular pair of guinea pigs had no influence on the ocular defects of their descendants.

**EYE OF THE NEGRO.**—**Kollock** has had an experience of over 30 years with the eye of the negro, and 23 years ago published his first paper on the defects of the eye peculiar to this race. In his experience syphilis is responsible for the great majority of all ocular lesions of negroes. For instance, 45% of all ocular nerve lesions consist of primary optic nerve atrophy. He wonders at the present date whether, or no, the adulteration of the cheap liquor used with wood alcohol may not be responsible for a good many of these atrophies.

In general, negroes are relatively immune to chronic inflammations of the conjunctiva, particularly to trachoma.



The latter, curiously enough, has never occurred in an epidemic form, in spite of the dirty surroundings of the average southern negro. Cataract and glaucoma are said to be about as prevalent in the negro as in the white. Kollock here refers to the improbability of eye strain as a factor in the production of cataract, as of the negroes he has seen during these years the majority do not read.

As regards refraction he finds very few myopes, although the highest grade myopia, a man of 26 D, happened to be a negro. A short discussion follows on the effect of civilization in the production of myopia in which discussion Kollock quotes the remarks of St. John Roosa and S. D. Risley on this subject. Only one case of uncomplicated strabismus in the pure negro has been observed by the author. Kollock concludes that the eye of the pure blooded negro is, with one exception, and that the increase of myopia, practically in the same condition as in his first report of 1892.

**EYES OF RETARDED CHILDREN.**—**Barkan** divides the mentally retarded children in whom ocular defects are found into two clinical groups: (1) those whose retardation is due to physical handicap which can be removed,—tonsils, adenoids, high grade myopia, or other marked errors of refraction; (2) those where in the absence of any marked general or local physical faults, a certain degree of mental retardation is present; evidenced often not only by negative inability to learn as others of the same age do, but also by positive traits. These children are unruly, disorderly, disobedient, petty thieves, constant truants from school, and confirmed liars.

In this second class of which he particularly speaks, he states that the visual tests display as the most common abnormality a marked difference in vision of the two eyes, or low vision in both equally; the first being slightly

the more frequent. Muscular balance tests seldom even approximate the normal, but show marked degrees of exophoria or esophoria, usually the former. By far the great majority are hypermetropic and also markedly astigmatic, a very small number are myopic.

Barkan finds that the vision of a certain number cannot be improved by proper glasses, and in these the fundus usually shows one of the following 5 pictures: (1) Fundus without or with very little pigment. (2) Excessively hyperemic discs, margins not distinguishable, veins dark and dilated. (3) Veins and arteries, normal in caliber, forming many small curves in their course over the fundus. (4) Discs of normal color and outline, but vessels branching off fan-shape, ("sprawling" off the disc is the descriptive phrase most applicable). (5) Excessively pale discs, vessels of normal size. Barkan does not find anatomic congenital malformations, such as coloboma of the iris and choroid, dermoids of the conjunctiva, epicanthus, microphthalmus, aniridia, etc., more frequent among these children than among mentally normal ones; but they are more frequent in idiots and imbeciles than in mentally normal children.

A certain relation between ocular defects and the general appearance of the children is striking. They form a group distinguished by being shorter, thinner, sallow and less active physically than their companions; but exceptions, of course, occur frequently. In conclusion, he urges thorough ocular examinations of mentally retarded children, stating that a small number will be remarkably improved by proper glasses. In those not amenable to visual improvement, we obtain by examination an index of the kind of work they may be expected to do in the future, as far as their vision is a factor; and can proceed to educate them accordingly.

## GENERAL DISEASES.

EDWARD JACKSON, M. D., F. A. C. S.

DENVER, COLO.

Many references to general diseases will be found in the sections of the Digest referring to the parts of the eye affected. Only papers of such general character as not to fall appropriately to either of those sections are here considered. The literature here covered extends from January, 1917, to October, 1918.

**MEASLES.**—**Bahn** believes that the catarrhal conjunctivitis which appears with an attack of measles is essentially similar to the catarrhal process in the respiratory tract; and depends upon the virulence of the measles contagion, plus the secondary infections by the ordinary pyogenic organisms. The treatment should be directed to the latter, as ethylhydrocuprein for the pneumococcus infection, or zinc for the Morax-Axenfeld bacillus. The ulcerative marginal blepharitis and chalazia, frequently following measles, may require treatment.

**SCARLET FEVER.**—In an epidemic of 2,000 cases of scarlet fever with 200 deaths **Giuseppi** saw 4 cases of corneal ulcer, 2 of iritis, and 4 of panophthalmitis, which all developed during the course of the disease. One case of corneal ulcer was fatal on the twelfth day, another that developed on the eighth day left the patient blind. One eye affected with iritis had to be enucleated. All of the cases of panophthalmitis were fatal and all ran an acute course. Bilateral *mydriasis* with ocular hyperemia was noted as always being followed by death within 48 hours. This was true even of patients who seemed not very sick when the *mydriasis* appeared. **Giuseppi** suggests that this symptom was caused by a severe toxic action on the adrenals and sympathetic nervous system.

**ANTITYPHOID VACCINATION.**—Numerous cases of ocular disease following antityphoid vaccination have been reported. But most of them seem to have had some other causative factor. **Ginestous** found that one man who complained of impaired vision suffered from a preexisting albuminuric retinitis, and another from tobacco amblyopia. In a third case bilateral kerato-

conjunctivitis developed two days after a fourth injection. It was followed by miliary abscesses in the right cornea, and ulceration of the left cornea with perforation. The right eye recovered full vision but the left had a central leucoma. In this case a febrile herpes, accompanying the temperature reaction, may have been due to the vaccination.

**Calhoun** saw two cases; one of iritis arising one or two days after his first antityphoid and paratyphoid inoculation. The iritis cleared up in about one month leaving full vision. The patient had previously suffered a gonococcus infection. The second patient developed blurred sight with corneal deposits, vitreous opacities and choroiditis a few days after his third inoculation. He had a 4 plus Wassermann. On account of the possible influence of the vaccination in exciting trouble **Lapersonne** urges that it should not be practiced on persons who have suffered from syphilis, arthritis, or tuberculosis.

The eye affections that occur in typhoid and paratyphoid fever **Gilbert** finds include supraorbital neuralgia, which he also saw after antityphoid vaccinations. He reported two cases of metastatic iridocyclitis occurring with paratyphoid.

**INFECTIVE JAUNDICE.**—The work of Japanese investigators tracing this disease (often called Weil's disease) to an organism which they call *spirocheta ictero hemorrhagica*, and for which **Noguchi** has suggested the name *lepidospira*, has led to its general recognition on the battle fronts of Europe; and the study of the ocular lesions which frequently accompany it. **Moret** found during the earlier stages, congestion involving the conjunctiva,



uveal tract, retina and optic nerve, often attended with hemorrhages. Among 30 severe cases of this disease he encountered two cases of true iritis.

**Weekers and Firket** among 50 cases found only four free from ocular symptoms. But these symptoms were in 29 cases only hyperemia of the anterior segment, in 7 congestion of the iris, and in 6 iritis. In 3 cases iritis accompanied optic neuritis and in one there was herpes. They point out that the chief eye symptoms do not arise during the acute febrile stage, but after the appearance of the jaundice and the second febrile reaction ten days to two weeks from the beginning of the attack.

**Hertel** observed corneal lesions in which he found the organism, and notes that panophthalmitis may occur. He experimented with rabbits and marmots, causing infections fatal in 7 to 9 days. The eye lesions occurred whether the animal was inoculated through the anterior chamber or in the peritoneum; spirochetes being found in the conjunctival secretions three days after intraperitoneal inoculation.

**THE PLAGUE.**—**Youdine** has studied 19 eyes of 15 persons dying of the plague, most of them being removed within two or three hours after death. The principal lesions were in the posterior segment, the inflammation of the ciliary body, iris and cornea appeared to be due to extensions forward of the uveal inflammatory process. The choroidal veins and capillaries were most dilated posteriorly. In all the eyes the retina was separated from the choroid by exudate. The bacillus pestis was not found indicating that the ocular lesions were due to toxins.

**CEREBROSPINAL MENINGITIS.**—**Lavagna** reports the case of a young man aged 23, who 11 months after an attack of cerebrospinal meningitis presented himself with purulent conjunctivitis, iritis, with posterior synechiae, diminished vision and contraction of the visual field in the right eye. The ophthalmoscope showed a focus of chorioretinitis with optic neuritis. Subsequently he suffered from detachment

of the retina still farther limiting his field of vision. These symptoms are ascribed to recurrent infection. The left eye remained normal throughout.

**Epidemic Encephalitis.**—Under various names there have been reported from Great Britain and France several series of cases of obscure etiology in which extreme ophthalmoplegia, ptosis, and nystagmus are among the most definite and constant symptoms. **Morax** reported on a series studied in the hospitals of Paris under the name "lethargic encephalitis." He found about one-fourth of the cases fatal. In the ophthalmoplegia the accommodation and iris movements are impaired in exceptional cases; generally only the external muscles suffer. **Hall**, of Sheffield, England, saw ten cases in a month, and entitled it "an epidemic of toxic ophthalmoplegia." The *Lancet*, (April 20, 1918, p. 580) promptly labeled it "botulism" poisoning, probably due to *Bacillus botulinus*.

**Dobson** reported one case, and **McCaw**, **Perdrau** and **Stebbing**, and **Duncan** seven cases from London, as "toxic bulbar paralysis, possibly botulism"; while **Buzzard** reporting another case called it a "toxic encephalitis." **Mel-land** reports his 13 cases occurring within 6 months under the title "epidemic polioencephalitis." In two there was marked optic neuritis, but in some cases the symptoms of ophthalmoplegia were slight or even entirely absent. **Kinnier Wilson's** seven cases are reported under the title "epidemic encephalitis," a name appropriate to a view of the disease which he supports by two necropsies. The bacillus botulinus has not been recognized; nor has any particular article of food been found to carry the poison. Among the 39 British cases there appear to have been eight deaths.

**MISCELLANEOUS INFECTIONS.**—The occurrence of iritis and cyclitis as a complication or sequel of dysentery is reported by **Maxwell** and **Keip**. The six cases seen by them were probably all of the bacillary type although one was doubtful. The ocular lesions appeared about one month after the first sign of bowel involvement. The im-

mediate prognosis of such cases is favorable, but the danger of subsequent relapses is still unknown. Three of the cases were accompanied by arthritis. **Fiessinger** and **Leroy** also noticed the association of iritis with arthritis. **Pacheco Luna** (A. J. O., v. 1, p. 658) recorded a case of acute iritis after amebic dysentery. It resisted the ordinary treatment for several weeks, but quickly recovered under injections of emetin hydrochlorid, coincident with the disappearance of the entameba from the discharges.

A case of **Vincent's infection**, exhibiting severe conjunctivitis and photophobia, along with lesions of the mouth and other parts of the body, is reported by **Bowman**. The conjunctival discharge contained flakes of whitish material.

A case of monocular optic neuritis following *pneumonia* is reported by **Tenner**. The trouble was chiefly retrolbulbar, but showed in blurring of the optic disc. Full vision was recovered after an absolute central scotoma. The ocular lesions of diphtheria are discussed by **Giuseppi**, who encountered but five cases among 5000 diphtheria patients. In one child the disease began in the conjunctiva. Both eyes presented diphtheria membranes, while other children in the family were attacked in the throat. All his cases yielded promptly to antitoxin treatment. He points out that the prognosis as to oculomotor palsies should be guarded, as the nucleus may be merely injured temporarily, or it may be destroyed by the toxin.

**GNOCOCOCCUS INFECTION.**—It was suggested that a statement "that 50 percent of blindness is due to venereal disease is an unwarranted reflection on the blind." **Traquair** replied, by reference to statistics; "more than 50 percent of the cases are due to such diseases in childhood." It may be admitted that later in life ophthalmia neonatorum causes no more cases, while other diseases and accident furnish an increasing proportion. Yet syphilis also furnishes an increasing number of blind eyes through iritis, optic atrophy, glaucoma, etc. While the proportion

varies at different ages, 50 percent may not be far wrong for the whole community. Each case of ophthalmia neonatorum furnishes more than the average number of years of blindness.

The practice in Glasgow of bringing mothers into the infirmary with infants who are to be treated for ophthalmia neonatorum has revealed important facts regarding blindness from this disease. **Chalmers** finds that such ophthalmia has occurred in successive children in several families; and also that the danger of blindness is much greater when congenital syphilis co-exists with ophthalmia neonatorum. During treatment of 227 babies with nongonorrheal ophthalmia one became blind; and of 151 babies with gonococcal ophthalmia one became blind. But of 42 suffering from both gonorrheal infection and syphilis 2 became totally blind. While 98 percent of the nongonococcal, and 87 percent of the gonococcal disease, were completely cured, only 42 percent of those with both syphilis and gonococcus infection were so cured.

With regard to the effects of notification of ophthalmia neonatorum the opinions expressed before the Commission on Venereal Diseases (British Journal of Ophth. v. 1, p. 390) varied widely. Mr. Cross thought it might be stamped out entirely. Mr. Jessop did not think it had helped much to reduce the number of cases. Mr. Harman found it served two useful purposes: it made medical men and midwives more careful, and it rendered early treatment more likely.

**SYPHILIS.**—In the above report regarding the frequency of syphilis as a cause of ocular disease **Jessop** gave the following figures as to the proportion of positive Wassermanns with certain ocular diseases: In iritis 45 percent, choroiditis 29 percent, interstitial keratitis 52 percent, primary optic atrophy 35 percent. **Brinkerhoff** in his report on 500 Wassermann reactions in patients with ocular disease, at Wills Eye Hospital, gives the positive results as: Iritis 46 percent, choroiditis 35 percent, interstitial keratitis 62 percent, and atrophy of the optic nerve 40 percent.



In estimating the significance of such figures one must bear in mind the proportion of persons in the whole community who have a positive Wassermann reaction. Such common percentage would be found for each of these diseases, even if syphilis had nothing to do with their etiology.

The work of **Sunseri** with the Porges' reaction to syphilis (the mixing of sodium glycocholates with the suspected serum) seems to indicate its value. In two cases of initial syphiloma it was positive when the Wassermann was negative. In the 80 cases of ocular disease it yielded 21 positive and 3 doubtful, against 19 positive and 2 doubtful with the Wassermann. The three cases doubtful with the Porges were positive with the Wassermann, and all recovered under specific treatment. In 22 cases of other conditions the Porges reaction was negative in all except one, a case of Malta fever.

The statistics of **Collins** regarding nervous manifestations of 790 cases of syphilis of the eye, have been referred to in the *Journal*, vol. 1, page 685. In general the different symptoms follow this order of numerical frequency: (1) Disorder of size, shape and contour of pupils; (2) Loss of light reflex; (3) History of diplopia; (4) Changes in the optic nerve. The frequency of involvement is greatest in the third nerve, next in the sixth and last in the fourth.

In discussing syphilis of the nervous system **Spiller** includes tabetic ocular palsies, and thinks the lesion in both these and the recognized syphilitic ocular palsies is not primarily nuclear, but it is in the nerve fibres as they leave the brain. He has reported cases of lymphocytic infiltration of the ocular nerve and believes most of these palsies are primarily in the nerve roots and not nuclear. This is in harmony with the observations that such palsies disappear or tend to recur. A case of bilateral amaurosis with syphilitic meningitis reported by **Charlin** is ascribed to lymphocytic infiltration in the region of the optic foramina. **Wieden** has reported a case of syphilitic chorioretinitis and optic atrophy in

which improvement of vision and fields followed injections of neosalvarsan.

**Seelert** reports a case of cerebral syphilis in which, with pathologic sensations in other parts of the body, he was tormented by "seeing" remembered objects, although they did not amount to hallucinations.

**Charles**, in a study of the teeth in the congenitally blind, finds that when one of the central incisors appears notched and the other normal, transillumination, by placing the light in the mouth behind them, may bring out defects in the enamel of the apparently normal teeth. Occasionally when there is no notching of either tooth that would ever otherwise have been called Hutchinson teeth, they may show areas of deficient enamel, or may be traversed by alternating lines of normal and deficient enamel. In one of these cases, a boy ten years old, congenitally blind with one notched tooth, was found to have the other defective. His blood Wassermann was positive and spinal fluid negative.

In the discussion opened by **Lawford** in the treatment of syphilis, he reported striking benefit from the newer remedies, salvarsan, etc., in iritis and in the primary lesions. In the oculomotor paralyzes these drugs had not proved markedly superior to mercury. In cycloplegia and iridoplegia they were worthy of trial in connection with mercury and iodides. In miosis and loss of light reflex and primary optic atrophy little benefit could be expected.

With regard to the interstitial keratitis of congenital syphilis the evidence varied widely and no conclusion could be reached; altho there seemed to be agreement that a single dose was of no value, but that repeated doses might be more effective. With regard to the unfavorable effects he thought there could be no doubt that the damage sometimes done to the optic nerve or oculomotor nerves must be ascribed to the drug, even though such lesions were sometimes cured by continuation of its use or by mercury. They are undoubtedly syphilitic, but are precipi-

tated by the administration of salvarsan.

**Browning** regards kharsivan and arsenobenzol as equivalents of salvarsan, and neokharsivan and novarsenobenzol as equivalent to neosalvarsan. In the discussion Harrison reported from an experience of 8,000 injections of kharsivan, 16,000 of salvarsan, and 20,000 of arsenobenzol that he had not been able to discover any practical difference between them. Some samples of kharsivan and arsenobenzol were less soluble than others; and these were followed by a larger proportion of immediate reactions.

He had large experience with a course consisting of three full doses of salvarsan and ten injections of mercury, the whole lasting ten weeks. But this still permitted about 30 per cent of relapses within the year. More vigorous treatment, as 8 injections of salvarsan, 0.3 gram, and 8 of mercury, promised better results. The deaths that occur commonly follow the later injections of a series given at intervals of less than 2 weeks. Also in discussion Lawson pointed out that where antisyphilitic treatment proved ineffective tuberculosis should be suspected and looked for. He believed the mixed infection was very unfavorable, and other speakers emphasized the importance of this mixed infection.

The importance of examining the eye with the ophthalmoscope in every case, before giving injections of arsenobenzol is emphasized by **Blanco**; as a means of guarding against the nerve lesions, the so-called neurorecidives. Only when the optic nerve is free from lesions and the vitreous clear of dust-like opacities should these remedies be given. **Maucione** makes a comparison of results obtained with neosalvarsan with those following the use of mercury and the iodides, which is favorable to the former. He gives 30 to 60 centigrams at intervals of 5 to 15 days.

In view of the dangers of the newer arsenic preparations **Abadie** urges the importance of prolonged mercurial treatment, especially by intravenous injections of mercury cyanid. They can be given every two days. For

optic atrophy or chorioretinitis he used 10 or 12 such injections, repeated after a few months. If then the condition improves, treatment is persisted in until 30 or 40 injections have been given. Persistent use of inunctions is also approved.

In the treatment of syphilitic and parasyphilitic affections of the optic nerves **Schoenberg** has urged the injection of remedies into the cerebral ventricles; arguing, from the beneficial result of intraspinal injections in spinal syphilis, that such a direct attack on the lesion was likely to prove effective and to prevent blindness. He has demonstrated by experiment that the intraspinal injections cannot reach the optic nerve; but it is reached by injections through the lateral ventricles. He was thus able to produce staining of the nerve during life.

**Gendron** reports that *galyl* is an efficient antisyphilitic remedy in doses that may be smaller than those of salvarsan, 0.15 to 0.20 grams, which can be repeated several days in succession, and that the mixed galyl and mercury treatment is efficacious and well borne. **Richard** finds galyl not inferior in antisyphilitic power to the other arsenic derivatives now commonly employed, and safe if properly used. It can be given by intravenous injection in doses of 0.2 gram, and at intervals of 4 days, and can be given in conjunction with mercurials. It seems better tolerated than salvarsan. He has seen a serious local lesion from escape of the drug into the cellular tissue. The general reaction, when it occurs, comes on in five or six hours, and lasts two or three hours. There is slight rise of temperature, malaise, headache, and vomiting. In 220 injections no renal disturbance was noted. **Akatzuka** has written on injections of sublimat, and on salvarsan and neosalvarsan for ocular syphilis.

**SPOROTRICHOSIS.**—The danger of confusing sporotrichosis with syphilis is illustrated by **Leoz**, in referring to a case in which vigorous antisyphilitic treatment failed to avert a fatal result. His two other cases were also treated for syphilis, before the proper diagnosis



had been arrived at. One had suffered 4 or 5 years, and had multiple destructive lesions of the cornea, conjunctiva and sclera. The Wassermann was negative. Large doses of potassium iodid, with ignipuncture of the lesions, were followed by complete cure.

In his third case, suffering from nodular infiltrations of the cornea, growing worse under mercury and iodid, with crater-shaped ulcerations surmounting fleshy elevations, and with swelling of the submaxillary glands, instillations of dionin, and potassium iodid, in large doses to the limit of toleration, produced a cure in 11 days. But when the patient had discontinued the drug four days, a small growth had reappeared and these multiplied rapidly. After this recurrence prolonged treatment was required, because of hypersensibility to the iodid; and the drug had to be injected into the lesions, in 5 per cent watery solution, with acoin. The sporotricum was demonstrated in cultures made from the fluid obtained by incising one of the tumors.

**STREPTOTHRIX INFECTION.**—In the case reported by **Sobhy** the lesions were grayish yellow waxy masses under the bulbar conjunctiva, in wavy lines running from the limbus toward the inner canthus. Under the microscope the ray fungus was shown. It had clubbed ends like the actinomyces.

**TUBERCULOSIS.**—In ocular tuberculosis the general symptoms are mostly lacking. Observed by ordinary methods the temperature curve throws no light on the case. **Smith**, however, insists that it is the one fixed factor in recognizing tuberculous fundus lesions. The daily range may be slight and is likely to include subnormal morning temperature, sometimes not rising quite to the normal average in the afternoon. But it is a range greater than that of health. He holds that in fundus lesions tuberculin for diagnostic purposes is useless if the ophthalmoscope does not show a focal reaction, and that doses should be regulated by the ophthalmoscopic changes. In the discussion Meader confirmed the view that a tendency to subnormal temperature is

significant, especially when this is brought about by exercise or fatigue.

In writing of the bacteriologic diagnosis of ocular tuberculosis, **Poyales** calls attention to the fact that exposure of the guinea-pig to X-rays increases its susceptibility to the tubercle bacillus. This can shorten the time required for the bacteriologic test by inoculation; and renders it more sensitive, a matter of importance where the bacilli are so scarce, and attenuated as they often are in ocular lesions. He reports 7 cases including lacrimal fistula, sclerosing keratitis, tuberculous retinitis,, tuberculous ulcer of the lid, iritis, choroiditis, and osteomyelitis with fistula of the upper lid, in each of which the bacillus was secured by staining or cultural inoculations. **Shiosi** reports a clinical and histologic study of ocular tuberculosis by experiments on animals.

To the ocular lesions of tuberculosis **von Hippel** contributes 3 cases. One of proliferating uveitis with detachment of the retina, occurred in a boy of 13. One was of tuberculous disease of the lens in a woman of 40, whose right eye was injured in childhood; who 4 years before had presented foci of the disease near the optic nerve, and now came, with a blind hyperemic uncomfortable eye for enucleation. The lens was entirely opaque and enclosed in a thin layer of typical tuberculous granulation tissue. The inflammatory round cells, and this tissue had broken through the anterior capsule. The third case was one of tuberculous corneal marginal ulcer, in a woman aged 42, coincident with tuberculous lymphoma of the axilla.

As illustrating the clinical appearances of a tuberculous condition of the optic nerve **Cramer** reported the case of a woman of 22, who presented a snow-white, or porcelain-white tongue shaped clouding of the retina, at the upper margin of the optic nerve, like opaque nerve fibres. Four days later this exudate showed marked swelling and extended on to the optic nerve head, in a yellowish red branch of tissue, hiding the central retinal vessels. Tuberculin injection produced local

and general reactions with severe pain in the eyes. Under local treatment with smallest doses of bacillus emulsion, the eye at the end of a year presented full central vision, a slightly restricted field, and somewhat reddened appearance of the optic disc that had been noted a month after treatment began.

Tuberculosis of the anterior segment of the eye is reported by **Zentmayer** in a woman of 32. The cornea presented a tongue-shaped area of superficial vascular haze. The pupils were irregular from synechiae, fibrinous exudate on the anterior capsule, and mutton-fat drops on Descemet's membrane. Both eyes were affected.

**Fernandez** points out that ocular tuberculosis is secondary, but usually the primary focus is latent, and that the ocular lesions rarely accompany pulmonary tuberculosis.

**Metz** reports a group of ten cases, including scleritis, sclerosing keratitis, and sclerochoroiditis, in which tuberculosis was definitely present in eight. The seven in which general reaction followed the diagnostic use of tuberculin showed negative physical findings. Of 9 reactions 8 were general and one focal. Tuberculin therapy employed in 5 cases secured apparent cure or marked improvement. **Nogawa** writes on superficial nodules in parenchymatous keratitis with tuberculosis. **Brose** concludes that tuberculin is more valuable as a diagnostic agent than as a curative one. It is proper to administer it therapeutically, but one must not expect production of antibodies such as occurs with typhoid serum. **Pierson** makes a plea for the more frequent diagnostic use of tuberculin.

**Verheyden** regards strumous keratitis as a form of localized tuberculosis, amenable to general treatment, but shortened by the use of tuberculin. In scleritis and episcleritis the specific treatment may prevent deeper involvement of the eyeball. In uveal inflammation he finds a field for tuberculin treatment, and in central tuberculous choroiditis and tuberculous paralysis of the third nerve, he reports good results.

Old tuberculin was used throughout. No injection given when the temperature was increased; and no increase of dose when mild focal reaction had occurred. **Faith** reports 4 cases of ocular tuberculosis, sclerokeratitis, choroiditis, and optic neuritis treated with tuberculin. He draws from these the lesson that the dose must not be too rapidly increased or too soon repeated.

**LEPROSY.**—As pointed out by **Cuevas Pulido**, in presenting a case before the Ophthalmological Society of Madrid, this disease so generally affects the eyes that cases frequently are first to be recognized when they apply for relief from ocular lesions. This fact gives importance to a general review and bibliography of the subject like that of **Yudkin** (*A. J. O.* v. 1. p. 303) whose two cases showed thickening of the lids with nodules, and one of them areas of anesthesia, and a lesion of the limbus and cornea.

The so-called symptom of **Hernando** is discussed by **Marquez**, who points out that this upward rolling of the eyeball, when it becomes impossible to entirely close the palpebral fissure, is essentially the symptom described by **Bell** in connection with facial paralysis; and closely related to the resistance to eversion of the lid, pointed out by **Gifford**, as a sign of exophthalmic goiter.

**Valettas**, resorting to the expedient of pressure on the sclera to bring the region of the ora serrata into the ophthalmoscopic field, discovered there, in two cases of leprosy, shining spots on a dark, pigmented background. This, he thinks, a rather early lesion in eyes becoming affected with leprosy. In these cases there was superficial keratitis and episcleritis; but the deeper parts of the fundus had not been invaded.

**POLYCYTHEMIA.**—The case of a woman aged 38 is reported by **Patterson**. She had been out of health eight months; hemoglobin 120 percent; blood count 8,896,000. Vision had been impaired for two weeks. The veins were almost black in color, slightly enlarged and wavy. In the right eye were a great increase of vessels on the optic disc, many retinal hemorrhages, a



white patch the same diameter as the disc, and another smaller one in the nasal retina. In the fovea was noted the appearance of a droplet of blood, and elsewhere many droplets of exudate.

**Cohen's** patient showed hemoglobin 140 to 160 percent, and blood count 8,000,000 to 10,000,000 red cells. Thrombosis of the central retinal vein had occurred in the right eye, and it was entirely blind. Here, too, there was increase in the arteries on and near the disc; and in both eyes some evidence of arteriosclerosis. This patient had a strongly positive Wassermann reaction. Of **Christian's** ten cases one died of thrombosis of the portal vein, and two of thrombosis of the cerebral arteries; three complained of disturbance of vision, but no account is given of ophthalmoscopic appearances.

**LEUKEMIA.**—**Cohen** reports the case of a woman aged 23, with hemoglobin 45 percent; red cell count 1,800,000; leucocytes 300,000 to 500,000, with 43 percent of polynuclears. The patient died of pneumonia. The ophthalmoscopic picture was a light fundus, disc dirty-white, blurred, and elevated above the surrounding retina. Retinal veins tortuous, dilated, dark red, arteries slightly tortuous. One retinal hemorrhage. On microscopic examination the choroidal veins were found dilated; which **Cohen** thinks an early manifestation of choroiditis. He concludes that in spenomyelogenous leukemia the ocular changes are analogous to those in other parts of the body. **Kümmell** gives a review of the German literature of ocular changes in leukemia, but makes from it no important deductions.

**INTERNAL SECRETIONS.**—The physiologic importance of the internal secretions in keeping up and regulating the nutrition of the different tissues, justifies the belief that they have an important influence on such highly organized tissues as are represented in the eye. The practical application of this hypothesis to retinitis pigmentosa has been mentioned by **Jones** (*A. J. O.*, v. 1, p. 113).

In addition general papers upon the subject have been published by **Zent-**

**mayer, Spencer, Schirmer, and Lamb.** The first two of these give general reviews of our knowledge of the subject, upon which new observations should be based. **Lamb** attempts to connect alteration in these secretions with general manifestations of nerve disturbance in the eye, especially with glaucoma. **Sewall**, in discussing **Spencer's** paper, points out that there appears to be no important specific action of any internal secretion upon the eye, in the sense that atropin is a mydriatic or eserine a miotic. But the general action of these secretions must have a profound influence on the eye as a part of the organic whole. **Daland** has written on the relation of the ductless glands to arterial disease.

**EXOPHTHALMIC GOITER.**—The view that this disease is primarily due to the influence of a focal infection upon the thyroid gland is advocated by **Dunn**, who reports 4 cases in support of it. One is the case of a woman of 26, who with infection and abscess of the left lower eyelid showed marked enlargement of the thyroid, and symptoms of acute over secretion. The lid abscess was opened and silver nitrat applied to the cavity. A mercurial was ordered and in less than a week the thyroid enlargement and symptoms of hyperthyroidism had disappeared.

The second patient, a woman of 36, had an enlarged soft thyroid, attacks of increased pulse rate, and abnormal nervousness. Both tonsils had diseased crypts. Enucleation of the tonsils, without other treatment, was followed by marked reduction in the size of the thyroid, disappearance of symptoms due to hypersecretion, and recession of the eyeballs.

In the third case, a woman of 50, with hyperthyroidism and enlarged neck, had diseased tonsils. The enlargement of the thyroid had come on with an abscess in the throat four years before. The fourth patient, a man aged 28, had Basedow's disease of three or four years' standing. A high degree of exophthalmos, with marked Graefe symptom and large bulging thyroid and high pulse rate. Both tonsils were diseased. Three months after their re-

moval exophthalmos had disappeared, the thyroid was not noticeable on careful inspection, and he felt well; altho he still had easily excitable pulse, and later some enlargement of the thyroid. This tendency, Dunn thinks, indicated a remaining focal infection somewhere in the body. (See also p. 176 and above section on Internal Secretions).

**NUTRITION.**—From his study of *eczematous ophthalmia (phlyctenular disease)* **Goldenburg** concludes that it is, in all probability, an expression of vagus system irritability, produced by some toxic agent resulting from faulty carbohydrate chemism. He thinks that tuberculosis, syphilis, and sepsis, can be excluded with certainty as causal factors.

The usual *senile changes* in the eyeball have been discussed by **Nagle**. **Bloch** writing of xerophthalmia and the dystrophy of infants, analyses the effect of different diets in a children's home; showing a deficiency in separator milk, that was made by the administration of cod-liver-oil.

**RENAL DISEASE.**—**Martinez** calls attention to the value of amaurosis as an early sign of uremia, if its real character and causation are determined by the use of the ophthalmoscope. **Phillips** reports a case of pronounced acidosis with swelling of the retina in the region of the disc, veins engorged and numerous hemorrhages. Blindness was complete.

**DENTAL DISEASE.**—The forms of dental disease that cause inflammation of the eye according to **Finnoff**, are pyorrhea, alveolar abscess and infections in or around the root, or around crowns and fillings. These conditions may cause keratitis, conjunctivitis, herpes, uveal inflammations, optic and retrobulbar neuritis, scleritis, episcleritis, panophthalmitis, abscess of orbit, thrombosis of cavernous sinus, and post-operative infection complications. He particularly calls attention to the danger of imperfectly filled dental canals. Eye reflexes may be caused by impacted or sensitive decayed teeth, pulp stones, or foreign bodies in the tissues. These may occasion orbital

pain, mydriasis and miosis, hysteric amblyopia, and possibly neuropathic keratitis. **Patterson** reports a case of recurring iritis promptly ended by extraction of an upper molar on the affected side, that was surrounded with pus. In a woman of 85 suffering from keratitis a root was found beneath an artificial denture; and this with two teeth condemned by X-ray were extracted. Six weeks later the vision had greatly improved, and the cornea had become almost clear.

**DISEASE OF MOUTH, PHARYNX AND TONSILS.**—**Patterson** also reports a girl of 11 years, with interstitial keratitis and uveitis with partial optic atrophy. The inflammation promptly subsided after removal of tonsils and adenoids. **Stauffer** reports two cases of reflex asthenopia relieved by removal of diseased tonsils. A general review of the literature by **Zentmayer** refers to reflex neuroses; oral sepsis, disease of the tonsils and pharynx, and post-operative ocular complications of oral origin. **Beck** calls attention to the relation between exophthalmic goiter and disease of the tonsils; and reports cases in which removal of the tonsils effected a cure of the symptoms when the usual treatment had failed.

**DISEASES OF NOSE AND ACCESSORY SINUSES.**—**Teal** points out that these affect the eye by extension of inflammation into the orbit, by pressure from collections in the sinuses exerted on the optic nerve, or the eyeball; and by toxemia due to absorption from empyema of the sinus. **Andrews** and **Stauffer** call attention also to the *reflex disturbances* of the eye, including asthenopia and disturbances of the ocular movements, as arising from irritative conditions in the nose. **Ziegler**, reviewing ocular signs associated with intranasal lesions, finds the three most active etiologic factors are pressure, areas of hyperesthesia and nasal obstruction.

A case of acute *chemosis* reported by **Tooker** is accounted for by *ethmoiditis*, causing a localized periostitis in the orbit, which resulted in stasis in the orbital lymphatics. Attention has been called by **Stephenson** to acute anterior



ethmoiditis, as a cause of orbital cellulitis in young children. The prominent symptoms are connected with the orbital disease, and little direct evidence of the ethmoiditis may be obtained.

Recovery generally occurs, sometimes with use of hot fomentations locally, and a purgative. In other cases an incision must be made, and sometimes dilated with forceps to give exit to pus. The incision should be as nearly as possible over the ethmoid cells at the upper inner angle of the orbit. He reports 10 cases, occurring in children of 14 days to 12 years of age, mostly under 5 years. In only one case did vision seem to be affected; and in this complete recovery followed. A case of orbital abscess from suppurative ethmoiditis is reported by **Bryan**, in a child 18 months old. Quick recovery followed a radical operation entering the ethmoid cells through the orbit. A similar case with the same treatment and result was encountered in a boy of 11 years.

**Rodman** reports a case of ethmoiditis in a man of 23, with joints and muscles involved in the secondary infection. He became blind in the left eye. X-ray examination revealed empyema of the left ethmoid, and following drainage all symptoms disappeared and vision became normal.

**Pfister** reports the case of a woman aged 20 who, after a week of pain in the head, had blurred vision in the right eye, which in three days became blind. Extensive operations on the ethmoid failed to give relief. But an external opening of the frontal sinus revealed a mucocoele; and in two weeks vision was restored to normal.

From a study of reported cases, **White** finds that retrobulbar neuritis may be acute following influenza accompanied by severe pain from distention of the sinuses and inflammation of the mucosa, or it may be chronic with less pain and acting either by pressure or toxemia; or, on opening the sinuses hyperplastic changes and periostitis extending to the optic canal are found. **Frias y Ornate** has written on the subject of ocular disturbances from nasal

disease. **Pooley** and **Wilkinson** report a case of unilateral blindness, with cystic degeneration of the maxillary antrum of the same side.

**THROMBOSIS OF THE CAVERNOUS SINUS.**—**Langworthy** has reviewed the relations of the cavernous sinus to other structures; and among the pathologic processes in which it may be involved, discusses thrombosis, for which he proposes an intranasal operation. **Dean** reported a case first seen with optic neuritis of the right side and chronic suppuration of the sphenoid. Exophthalmos appeared two days later, and death ensued two days after that. **Boot** reports a case arising from furuncle on the side of the nose. Exophthalmos extended to the opposite side in 24 hours. He also saw one arising by extension from the lateral sinus. Both were fatal. **Halipre** and **Petit** report a case of sinus thrombosis following otitis, with bilateral facial paralysis.

**ORGANIC DISEASES OF THE BRAIN AND SPINAL CORD.**—**Holden** points out that the routine examination of the eyes of a patient with nervous disease should include: The sensibility of the cornea, size, shape and reaction of the pupils, abnormalities of the extrinsic ocular muscles, acuteness of distant vision, fields of vision, exophthalmos, protraction of the lids, and evidence of inflammation, injury or operations. He takes up the details with reference to each of these points.

From his study of 53 cases of dementia precox **Teal** concludes that the changes in the optic disc and fundus of the eye are not pathognomonic. He believes, however, that there is an eye syndrome in this disease, viz: enlargement of the pupil with absence of its psychic and sensory reflexes and natural "springiness."

**Unger's** study of the etiology and symptomatology of juvenile tabes includes reports of four cases and a review of the literature. In all his cases there was hereditary syphilis; and other factors seemed of minor importance. In one case the first symptom appeared in the seventh year, in 2 cases in the eleventh year, and in one between

16 and 20. In all there was loss of the light reflex. Anisocoria occurred in one; the accommodation showed total paralysis in one, and the lid movements were disturbed in the others. Atrophy of the optic nerve was an important symptom in all, with accompanying changes in the field of vision.

**Parker** reports a case of multiple sclerosis with ocular changes, the history of which began at the age of 17, with diplopia and failure of distant vision. The optic nerves were pale and the fields of vision concentrically contracted. There was nystagmus and some dilatation of one pupil. He points out that the ocular symptoms may be necessary to make the diagnosis between this disease and hysteria.

Of **Birch-Hirschfeld's** 86 cases of disseminated sclerosis 71 showed ocular symptoms; 19 of these had pallor of the optic disc, 15 in both eyes. But in 15 cases of pallor of the disc, vision and the fields were normal. In one case there was retrobulbar neuritis with central scotoma; and in 7 cases optic neuritis or retrobulbar neuritis. All of these latter were under 30 years of age. Muscular defects were found in 13 cases. The indications that retrobulbar neuritis will be followed by disseminated sclerosis, according to **Jocqs**, are youth of the patient, unilateral veiling of sight, headaches preceding the eye symptoms, a larger scotoma than with toxic amblyopias, and a brief duration, usually not more than 7 or 8 weeks.

**Wechsler** urges that no essential differentiation can be made between tabes, paresis, and cerebrospinal syphilis, so-called. He thinks the terms paretic, tabetic, meningovascular, and diffuse neurosyphilis, are much better. He reports a statistic study of 122 cases, 92 of tabes and 30 of paresis. In the former the Argyll-Robertson symptom was present in 76 per cent, and in 4 per cent the pupils were normal. Miosis occurred in 32 per cent. Anisocoria occurred in 30 per cent, mydriasis 4 per cent. The shape of the pupil was irregular in 39 per cent. There were muscular palsies in

7 per cent, all unilateral. Optic atrophy generally bilateral was found in 16 per cent, and true nystagmus in one case. In general paralysis the Argyll-Robertson symptom was found in 37 per cent, and optic atrophy in 6 per cent.

Two cases of multiple sclerosis reported by **McGurn** are ascribed to the repeated inhalation of *carbon monoxid* from furnace gas. Disturbance of eye movements, diplopia, nystagmus, inequality of reaction of the pupils, and great impairment of vision were noted. The optic discs were swollen and edematous with enlarged veins. Repeated Wassermann reactions were negative, and other evidence tended to exclude syphilis.

Blindness following violent convulsions is reported by **Pritchard**, and he adopts the explanation that such attacks are produced by nerve storms, involving the visual as well as the motor centers. The ophthalmoscopic appearances were almost normal throughout.

Three cases of *herpes zoster* ophthalmicus are reported by **Klinedinst**. Serious involvement of the cornea occurred in each, an ulcer being formed by the coalescence of smaller lesions. In the local treatment holocain was used with good results. The relation of ophthalmic conditions, especially optic neuritis, and disturbances of eye muscles, and the intracranial complications of aural disease are discussed by **Smith**.

A case of myasthenia gravis is reported by **Krähenbuhl**. The patient was a woman of 31 and the trouble began at 20 with diplopia appearing toward evening and slight ptosis of the left eye. She improved from time to time under rest, massage, potassium iodid, strychnia, heliotherapy, arsenic and galvanization, but relapsed. The ptosis became bilateral, and there was nystagmus and lacrimation.

**FUNCTIONAL NERVOUS DISEASE.**—A case of neuromyolytic ophthalmia reported by **Merida Nicolich** followed the injection of alcohol into the Gasserian ganglion for persistent trigeminal neuralgia. Five days later there was failure to close the lids, some blurring of vision, but no complaint of lacrima-



tion. Examination showed a neuro-paralytic keratitis, which grew progressively worse with ulceration and suppuration that involved the conjunctiva and extended into the lacrimal sac.

To a group of definite nervous symptoms and break down, caused by eyestrain, **Des Voeux** applies the term "blepsopathia." Its leading symptoms are headache, migraine, depression of spirits, fatigue, fear and panics, indigestion, disorders of sleep, giddiness, and "attacks," which seem to include syncope, petit mal, vertigo, unconsciousness, epilepsy, vomiting, and temporary paralysis. He gives a table of 100 cases illustrating this condition. The eyestrain which causes these symptoms is produced especially by the minor degrees of errors of refraction, in brain workers and town dwellers. It is uncommon with the higher degrees. It first shows in childhood, is easily cured in youth, and with more difficulty in older persons. It is useless to pay attention to the patient's report on his eyesight, and the opinion of many oculists is but little more reliable.

**Harwood** finds that an uncorrected error of refraction is always a potential cause of giddiness. Heredity and education may be disastrous, but once the muscular mechanism has become unstable vertigo may arise from any special strain; as reading, stooping, lacrimation, watching moving pictures, glare, or games like tennis. Among remedies for deficient nerve energy **Harwood** elsewhere suggests, covering one or both eyes, use of cycloplegics, accurate correction of refractive errors, and the use of prisms or of tinted lenses.

**Oloff** writing on psychic injuries of the eyes in war states that few are caused by battle. Most cases are local manifestations of hysteria, as shown by other symptoms, but he gives two cases in which hysteric symptoms were confined to the eyes.

**Loeb** reports a case of hysteric complete ptosis in a girl aged 10. Forcible massage of the lids, with the suggestion she could open her eyes, enabled

her to do so, and subsequently galvanism completed the cure. As a cause of hysteric blindness **Morrison** suggests fear of blindness from persistence of after images. He reports 2 cases occurring in a girl of 11, and a boy of 12.

A class of visual hallucinations occurring in middle aged women during the involutional period is discussed by **Gordon**, who reports 4 cases. The images seen were multiple, all of a diminutive size, and resembled each other in color, position, and actions. His patients all recovered. In a paper on hysteric disorders of vision **Yealland** makes a distinction between cases in which paralysis is accompanied by contraction of antagonists and cases in which no such contraction occurs. The phenomenon may be demonstrated with reference to blepharospasm, ptosis, and spasm of accommodation. In limitations of the visual fields and amblyopia muscular contractions may be observed in other parts of the body.

Migrain with ophthalmoplegia, **Kennedy** suggests, may be due to increase of intracranial pressure, which might be capable of producing paralysis of the cranial nerves. In discussion **Onuf** inquired how the cases accompanied by transient hemianopsia would be explained. **Litchy** found migraine the most frequent form of headaches, occurring in 700 out of 15,000 patients. Much may be done for it by attention to causes that excite or aggravate the attacks.

**SYMPATHETIC LESIONS.**—**Burger** points out that the Claude Bernard-Horner symptom is rarely met with in war injuries, wounds capable of producing it usually proving fatal from hemorrhages. He reports a case caused by a fragment of glass in which death from hemorrhage was prevented by tying several vessels. The next morning there was slight ptosis, moisis, and enophthalmos with preservation of pupillary reflexes and excessive lacrimal secretion. Intraocular pressure was equal in the two eyes, visual acuity was unaffected but there was diplopia on looking up and to the opposite side. Three weeks later the last two symptoms had disappeared, the others re-

mained. There was no vasomotor disturbance or alteration of respiration.

**THE OPHTHALMOCARDIAC REFLEX.**—This attracts wide attention but its literature yields little of interest to the ophthalmologist. **Laubry** and **Harvier** believe it acts by exciting the pneumogastric nerve so that its affects are multiple and complete. Opposite results may be obtained when the compression is prolonged from those where it is brief. **Petersen** thinks the reflex deserves great attention because it is easy to elicit, and more effective than pressure on the nerves. **Mougeot** and **Duverger** discuss the reflex in wounded men. Of 190 wounded in the eyes, 5 developed bradycardia probably from concussion; which may act by hypertension of the cerebrospinal fluid. They think that if the reflex reappears after trephining the disturbances are only functional. But when there is no return organic lesions must be assumed.

**Oppenheim** has studied this reflex in 47 men who had suffered from brain concussion, and in 87 whose skull wounds had required trephining. No regularity of the phenomenon could be observed, but he thinks it may afford a valuable basis for estimating the

significance of subjective symptoms. **Gorriti's** investigations among 721 insane showed that the normal reflex was obtained in 589, and no type of mental disease gave exclusively negative findings. **Aquini** reports a case of hiccough that had continued over 24 hours uncontrolled by other treatment which yielded at once to compression of the eyeballs. The pulse grew slow and the exhausted man fell asleep. A recurrence next day was aborted by the same procedure.

**GENERAL PAPERS.**—In a paper on some of the general *skin diseases* with ocular manifestations, based upon 10 cases, **Weidler** discusses: Acne rosacea, Blepharochalasis. Eczema, Favus, Leprosy, Lupus erythematosus, Solid edema and Pemphigus. Under the heading "Disturbances of Vision from Pelvic Disorders" **Rumsey** reports five cases, including: Interstitial keratitis aggravated, and episcleritis recurring at the menstrual period; retinal hyperesthesia, retinitis and optic neuritis. Papers on the relation of the eye to general diseases have been published by **Fischer**, **Alexander**, **DeBoe** and **Adams**.

## PARASITES.

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This section deals with the animal parasites which affect the eye, whether located in it or elsewhere. It reviews the literature from January, 1917, to September, 1918.

**MYIASIS OF THE CONJUNCTIVA.**—**Navarrette y Mas** has observed a case of myiasis in a woman, the daughter of a shepherd, who suddenly felt in the left eye a sensation of foreign body with itching and frequent sneezing. Two days afterward she could observe by looking in a mirror, that small, white worms moved in the eye. On examination the author found three worms on the bulbar conjunctiva and six in the upper fornix, which were extracted and proved to be larvae of the species *Rhincestrus nasalis* (de Geer, 1776).

**Maggiore** reports the case of a boy, who for eight months had been treated for a circumscribed inflammation in the upper segment of the scleral conjunctiva, without discharge. A transparent cyst was afterwards formed near the sclero-corneal limbus. The upper quadrant of the bulbar conjunctiva showed on examination a large number of dilated veins, superficial and deep; and adherent to the sclera a roundish structure approximating in shape a cigar, about one centimeter long and three millimeters wide. Inspection with the bin-



ocular microscope revealed the presence of an encysted parasite, disposed in imbricated rings, which after removal was recognized as a fly larva; but the exact variety could not be determined. An interesting point is the absence of any inflammatory process, and the resemblance to an ordinary lymphatic cyst of the conjunctiva.

**CYSTICERCUS.**—**Chistyakoff** has written on cysticercus in the eyelid, and **v. Herrenschwand** on the subretinal variety. But their papers are not available for review.

**HYDATID CYSTS.**—**Demaria** asserts that although *echinococcus* is one of the every day affairs of surgical practice in Argentina, where it is very common in the orbit and all parts of the body, the intraocular localization of this parasite has never been described in that country. Even in the whole ophthalmic literature there are only four cases reported, and only one of them is entirely reliable. This is more surprising when contrasted with the cysticercus, which is so frequently found in the interior of the eye. Yet both tenias, the solium and the echinococcus, live and migrate in the same way.

**Demaria's** patient had a secondary glaucoma in the left eye, which was attributed at first to an intraocular tumor. A trephining operation was done; but the relief was temporary, and the pain came back so that the eye was enucleated. Section of the eyeball produced a clear, transparent liquid, and showed the vitreous completely filled by a cyst, which everywhere veiled the retina and was adherent to it, the ciliary body and the lens.

The cystic membrane had the usual characters of the echinococcus; but no free daughter cysts were present, only several proligerous vesicles were adherent to the wall and contained scolices. A very important feature was the absence of a pericystic membrane and of leucocytic infiltration, which the author attributes to the lack of inflammation in the intraocular structures; greatly contrasting with what so commonly occurs in cysticercus cases, where an intense iridocyclitis is almost the rule.

In order to ascertain if the echinococcus could be reproduced experiment-

ally in the interior of the eye, **Demaria** made injections of hydatid sand, taken from the liver of man and pig, in the anterior chamber and vitreous of rabbits' eyes. After some months he was able to observe the reproduction of the disease; cysts being formed in the cornea, iris, ciliary body, sclera and vitreous, and also under the retina. He could also demonstrate that the proligerous vesicles, and even the scolices, are able to reproduce echinococcus cysts, as **Davé** has previously pointed out.

**FILARIASIS OF THE CONJUNCTIVA.**—**Stuckey** and afterward **Trimble**, have described under the name of "Circumocular Filariasis" cases of conjunctival worms, found in men and in one dog, in China. The first author examined a patient complaining of having "worms" in his eye, who produced a bottle containing an object similar to a piece of thread, which he had removed from his right eye two days before. Examination failed at first to disclose anything abnormal on the conjunctiva, but on careful inspection of the upper fornix, an almost invisible body was seen moving freely. Three other worms were also found and extracted, all of them looking like white threads.

**Trimble's** patient had a marked ectropion of the right lower lid and a slight one in the left, which began two months previously with pain, excessive lachrymation and later inability to close the eyes. The ectropion was more of a sagging away of the lids, and proved to be due to a complete facial paralysis on the right side. There was slight conjunctivitis, but a careful observation brought to light in the superior fornix of the right eye two small worms, of a pink colour and very active, which were easily distinguished from the slightly congested membrane.

As soon as these were removed the pain subsided, epiphora disappeared and the muscular tone of the paralyzed area was restored to at least 50 per cent of the normal. The facial paralysis was probably due to the parasitic irritation, extending over three months.

**Houghton** who examined the parasites obtained from **Stuckey's** case, and another coming from the eye of a dog,

declared them to be varieties of the *Filaria palpebralis*, Wilson, 1884; a nematode worm commonly affecting the eye of the horse. These filariae have also been found on cattle in France, Belgium and India.

Leiper summarizing the reports of these cases believes that, according to the description, the parasites differ from filaria worms in several important respects, both as regards their morphology and development. These worms have been recently (1915) grouped by Railliet in one family; the *Thelaziidae*, divided in three genera: *Thelazia*, *Ceratospira* and *Oxyspirura*. All parasites found in the eyes of mammals are now confined to the genus *Thelazia*. The other two genera contain the worms which live in the eyes of birds. In the cases reported above, the parasite was certainly of the *Thelazia* genus; although it is not certain if it was the *T. lacrymalia* or the *T. callipoeda*.

Cabaut has observed two cases of *filaria loa*. In the first the parasite was moving rapidly under the skin of the lower lid, from where it was removed by means of a threaded needle passed around the worm; the thread being immediately tied in order to capture the parasite. A small incision on the skin afforded a way to pull out the filaria. Another worm was seen under the conjunctiva in the same eye some days afterward and partially removed. Examination of the blood in day time demonstrated great quantities of embryos surrounded by a sheath and marked eosinophilia. In the second patient the parasite was also observed under the conjunctiva. Attempts at extraction were only partially

successful, due to the swiftness of the worm.

Pacheco Luna describes some disturbances of vision in patients suffering from a disease known in Guatemala as "Coast erysipelas" and due, according to the researches of Dr. R. Robles, to the infection with a variety of filaria, probably the *Onchocerca volvulus*, Leuckart, 1893. The doubts still existing about a definite classification are due in part, to the fact that none of the European authors mention among the symptoms produced by this parasite the ocular disturbances, which have been the most important in the author's cases.

These disturbances are: photophobia and diminished vision as subjective signs, and objectively a keratitis especially marked in the part disclosed in the palpebral fissure, and consisting of small dot-like whitish, superficial infiltrations similar to the keratitis superficialis punctata of Fuchs, and the central subepithelial keratitis of Adler. There is no conjunctival or ciliary injection. Iris normal. These lesions run a chronic course lasting for years and when recovery is to be made they diminish, but do not disappear completely, leaving permanent infiltrations.

If the disease goes on unchecked the iris becomes involved and a chronic, insidious iritis sets in, with contraction of the pupil and great diminution of sight. At last the dots become more abundant in the lower half of the cornea and form a uniform, diffuse infiltration giving this membrane the appearance of ground glass. The pupil is stretched downward and becomes irregular and occluded.

## HYGIENE.

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This section deals with the hygienic aspects and prophylaxis of conditions and diseases, the other aspects of which are dealt with in preceding sections. It covers the literature from January, 1917, to October, 1918.

**LIGHTING IN ITS RELATION TO THE EYE.**—In Ferree's work the object has been to compare the effect of different lighting conditions on the eye, and to

find the factors in a given lighting situation which cause the eye to lose in efficiency and to experience discomfort. Tests were made to determine the



eye's aggregate loss in functional activity and to analyse this effect.

**Powell** discusses the color of artificial light, and its relation to the medical profession; and concludes that the Mazda C-2 lamp gives light that approximates the sunlight. This result is obtained by a blue glass globe that permits the uniform transmission of the various colors of light. The lamps are standard and are listed in sizes from 75 to 500 Watts or from 60 candle power to 550 candle power. This lamp is particularly applicable in the chemical laboratory: In microscopic work, in ophthalmology and in examination of X-ray plates. **Luckiesh** writes on color in lighting and investigation of diffusing glassware; and **Worthing** on rating lamps as to filament brightness with fluctuation.

**Kerr** says that the maximum brightness which the eye is prepared for, is the brightest sky, apart from the actual image of the sun. This amount is generally taken as 2.5 to 3 foot candles to the square inch, and some such amount has been suggested as the standard for any visible source of lighting. **Kerr** thinks that the indirect system of lighting is not advantageous where small objects or textural surfaces have to be examined. It would be good in a bank, but bad in a school.

Direct lighting is the most economical method for handling objects or manufacturing processes. But the light source must be kept out of the field of vision, and shaded down to 3 candle power per inch for any visible surface, or it will cause strain and fatigue. Excessive or defective contrast may be equally troublesome. The New York Commission standard of 1 to 20, and 1-100, requires further investigation. Flicker is more evident to the peripheral retina than to the macula, and is due to alteration in light and shade slow enough to invoke continual efforts at adjustment. It is in this, perhaps, that pupillary contractions are most to be regarded.

**Prosser** holds the opinion that the color of the surroundings has an enormous effect on the recovery of the sick, especially those who are depressed

from one reason or another, or are suffering from shell shock. To remove from the patient the idea of being shut in is of utmost importance. So by a color scheme for the ward he endeavors to give the impression of out of doors. The effects are said to be beneficial.

**Marks** enumerates the advantages of good light in factories and the present status of factory light (especially quoting from reports of British Committee on Health of Munition Workers). His summary of general requirements for good illumination in factories is as follows:

(1) Sufficient illumination should be provided for each workman irrespective of his position on the working space. (2) The lamps should be properly selected and so installed as to avoid or minimize strain on the eyes of the workman. The type of lamp should be adapted to height of ceiling and closeness of work. (3) The lamps should be operated from sources of supply which will insure continuity of service and steadiness of light. (4) Adequate illumination should be provided from overhead lamps so that sharp shadows may be prevented as much as possible. (5) In addition to the illumination provided by overhead lamps, individual lamps should be placed close to the work if they are absolutely necessary, and in such cases the lamps should be provided with suitable opaque reflectors. The lamps should be placed if possible without the field of vision.

**INJURIES OF EYE BY LIGHT AND OTHER RADIATIONS.**—**Burge's** conclusions on the injurious effect of ultra-violet radiation on living tissue are: That ultra-violet radiation kills living cells and tissues by changing the protoplasm to form an insoluble compound. The effective region of the spectrum in changing the living material of the cells lies between 254  $\mu\mu$  and 302  $\mu\mu$ . An opacity of the lens can be produced in fish living in solutions of calcium chlorid or calcium nitrat, by exposing the eye of the fish to radiations from a quartz mercury vapor lamp. Abnormal quantities of the salts of calcium and sodium silicat in the cells of

the eyelids and of the cornea increase the effectiveness of ultraviolet radiation in producing anterior eye trouble.

Verhoeff and Bell in their work on the "Pathological Effects of Radiant Energy on the Eye" conclude as follows: "Abiotic action for living tissues is confined to wave lengths shorter than  $305\mu$ , at which length abiotic effects are evanescent, while for shorter wave lengths they increase with considerable rapidity.

Liminal exposure capable of producing photophthalmia to the extent of conjunctivitis, accompanied by stippling of the cornea is in terms of energy  $2 \times 10^6$  erg-seconds per square centimeter of abiotic radiation, of the character derived from the quartz lamp or the magnetite arc. About 2 1-2 times this exposure is required to produce loss of corneal epithelium.

The abiotic action on the cornea and conjunctiva produced by any radiating source follows the law of inverse squares, and is directly proportional to the total abiotic energy received. After exposure of the eye to abiotic radiations, there is a latent period before any effects, clinical or histologic, become perceptible.

The combined effect of repeated exposure to abiotic radiations is equivalent to that of a continuous exposure of the same total length, provided the intermissions are not long enough to establish reparative effects. Actual abiotic damage to the external eye renders it temporarily more sensitive to abiotic action.

**SNOW-BLINDNESS.**—Daland's conclusions after a visit among Eskimos are: (1) The Eskimo possesses no immunity from snow-blindness. (2) Snow-blindness occurs on cloudy days or dark days as well as on sunny days. (3) One attack of snow-blindness predisposes to another. (4) Snow-blindness occurs in animals. Ross saw snow-blindness in a bear in the arctic region. (5) Eskimos show great cleverness in making goggles for prevention of snow-blindness. (6) There is association of conjunctivitis and corneal erosions with chorioretinitis in snow-blindness. (7) The ultraviolet

ray causes conjunctivitis, corneal erosions, and possibly chorioretinitis.

**MOVING PICTURES.**—Berry made a special study on the relation of the moving picture to defective eye-sight. He states; that with proper illumination of the auditorium and proper projection on the screen, after good mechanical preparation of the pictures, there is small hazard to eye-sight.

Kerr thinks constant fixed attention with the eyes in a dark adapted condition is unusual and soon gives rise to strain. The practice of remaining in the hall and seeing the same series of films over and over again should not be allowed, especially by children. The question of the length of such entertainment for children is of importance. The best position to view the pictures from is between 20 and 30 ft. from the screen, on a level with the center. If viewed from nearer than 20 feet or from below or the side futile efforts at accommodation are induced. The amount of flicker depends a good deal on the skill of the operator and the quality of the film.

Wilson has pointed out that an investigation carried out in Glasgow schools by H. Wright Thompson, in which 50,000 children were examined, showed that while the proportion of real ocular defects was fairly constant, the proportion of children with defective vision varied from 53 per cent in the crowded and poorer parts of the city to 20 per cent in the outskirts where the children enjoy good hygienic conditions. The patients attending Harman's clinic were of a respectable artisan class and lived under good hygienic conditions. The only novel factor to account for the increased number of children with defective vision without any organic ocular defect seemed to be the cinematograph.

Pollock believes, that with frequent attendance at moving picture shows, children from 4 to 8 years of age develop a tendency to convergent squint, in the absence of errors of refraction; and in older children it causes congestion of the optic nerve and eye strain.

Bahn's conclusions are that moving pictures under favorable conditions do



not cause as much fatigue as the same period of concentrated reading. Most persons who complain that moving pictures cause eye discomfort have some ocular defect. Under favorable conditions the pictures act as a test of distant eye endurance.

With regard to the lighting of moving picture houses, Kerr makes these suggestions: (1) That the standard of illumination of the screen be fixed at a minimum of 1 foot candle. (2) That the material of the screen should be good matt-white screen. (3) In illumination of the theater, extreme contrasts between the screen and the general surroundings should be avoided. The ratio of 1:100 would imply brightness of surroundings of not less than 0.01 to 0.02 foot candles. For illumination of the seats 0.02 to 0.05 foot candles has been suggested. Any lights indicating exits should be screened so that their brightness does not exceed 3 c. p. per square inch.

**EFFECTS OF GLARE.—Kerr** states that *glare* is more important than abnormal refraction or the provision of spectacles. He points out that eye strain due to its influence becomes increasingly obtrusive after the twelfth year: It is especially insistent in reading, writing, and figuring; and is particularly distressing under artificial illumination. He urges as an absolute rule that no naked filament, mantle or flame should be permitted; nor any source of light with greater intrinsic brilliancy than three foot candles per square inch. The influence of paper in producing glare is explained. The blackboard, as a source of glare, comes in for attention.

**ILLUMINATION FOR FINE HAND WORK.—Pol** thinks that the practical conclusion is that it is impossible to set up a definite standard for minimum illumination; the individual conditions vary so widely. If a minimum is to be selected the tests described point to 288 candle power meters, for vision of 0.8 to 0.5.

**EYE STRAIN AND HIGHER EDUCATION.—Heard** presents the subject of hygiene of the eyes in relation to the school life of the child, and carries it

up to the field of higher education in college and university.

**CLASSES ON THE CONSERVATION OF VISION.—Irvin** reports that the children assigned to this class are those whose eye-sight is so defective as to make continuous use of the book type of ordinary size inadvisable; and whose distant vision with glasses is more than 6/60 and less than 6/15. Children with high refractive errors, which are likely to be progressive unless all eye strain is removed, are also regarded as suitable candidates tho their vision exceed 6/15. The aims are first to instruct the pupils with a minimum of eye strain; second to conserve the vision they possess; third to provide such vocational guidance, and if necessary vocational training, as will enable them to fill the most useful places in the community their powers will permit.

**OCULAR WORK AND REST IN CHILDHOOD.—Cutler** states in the introduction to his paper that it is not based on data, contains no narration of cases or of results, and deals with matter essentially commonplace. But he speaks of children's eyes in relation to their work, with especial reference to certain tendencies, the early recognition of which is vital to normal development.

**UNUSUAL DANGERS.—Jackson** in an editorial comment on the great number of persons blinded in the Halifax disaster, points out the dangers in certain emergencies of standing facing window glass. Sudden explosion, or wind may produce injury leading to blindness. He also points out the great danger there is in the free use of the air-gun in the hands of children.

**PROTECTIVE GLASSES.—Greeff** describes two substances, *cellon* and *triplex glass*, which have proved useful in the manufacture of war glasses. Cellon is a derivative of cellulose and related to celluloid; but is not inflammable and not affected by acids or acrid gases. It is used in very thin plates in sand glasses, gas masks, airships, etc. Triplex glass consists of two thin plates of plate glass, with a layer of cellulose between, which prevents wounds of the skin and eye when they

are splintered. The official military snow spectacles, which have proved useful, are made of simple smoky gray glass with a lateral wire sieve attachment. For gas masks, plates of cellon are mostly used.

**Higgins** recommends triplex glass for spectacles, as a substance that will not break and splinter. He advises every one who has to wear glasses for distance, especially those who shoot, to have them made of triplex glass. Such glasses guard against injuries from small foreign bodies, such as shot; and so far as he is able to judge, there is no difference in refraction between triplex and ordinary glass. **Giuseppi's** iron goggles having slits, transverse and slanting, permit ample vision. A circular piece of woolen goods is fastened around the part that serves as a lens. This absorbs sweat dripping from the forehead.

**Cruise** examined 320 eyes injured in war, and comes to the conclusion that slightly over 50% of injuries to the eyes in war are preventable. His percentage agrees with the findings of **Morax** and **Moreau**. Both **Cruise** and **Morax** agree that some sort of visor or shield would prevent these injuries. **Cruise** invented a steel mesh visor that fastens to the helmet for this purpose.

**Walter**, with large experience along beaches and roads of Florida, finds that amethyst tinted **Crookes'** and noviol glasses are better than amber tinted ones. The lightest shade which gives relief from irritation is always given.

**Richardson** evolved the idea of making use of the *stenopeic slit* in spectacles to wear in the movies. He found them very beneficial. They have been tried and found highly efficient for other purposes than just the movies. They have been tried by pilots and by the captains of several large liners, and they have found that in moonlight or on a sunny day they can see farther with the spectacles than they could without them. The United States Government has made a number of tests, on the firing line and in the aviation field, and the efficiency of the marksman is greatly improved by the use of these spectacles.

**Kirkpatrick**, to protect the eye after cataract extraction, has a special form of goggles made of aluminum. The shield is made to fit the orbital margins. The two shields are held together by a piece of tape which serves as a bridge and is kept in position by a tape passed round the head above the ears. Each has a large opening in it. For the eye operated on this opening contains a lens of amber glass; the other opening is left free. This sort of protection has been substituted for the dressing the day after operation.

The different types of goggles for protecting the eyes in industrial processes, **Luckiesh** enumerates as:

Goggles for protection against flying materials; Goggles for protection against gases, fumes, and liquids; Dust goggles. "The goggle has the greatest possibilities for the saving of the sight of men engaged in hazardous industrial occupations."

"The requirements of goggles for protection in these operations are that they shall provide sufficient reduction of the intensity of the light, be effective in absorbing the ultraviolet rays, keep the eye cool, and transmit as much as possible of the visible spectrum without color distortion."

Valuable data on this subject are given in a recent publication entitled, "Glasses for Protecting the Eyes from Injurious Radiations," by **Coblentz** and **Emerson**. "The data given by these investigators show that of the infrared rays emitted by a furnace heated to 1,000° to 1,100° C., (1) 99% are obstructed by gold plated glasses; (2) about 95%, by sage-green or blue-green glasses; (3) about 60 to 80% by very deep black glasses, and (4) about 60% by greenish-yellow glasses. At higher temperatures these data would be somewhat different."

The glass, which, in the opinion of **Crookes**, provides most satisfying protection is sage-green in color, which in a plate 2 mm. in thickness, is opaque to 98% of the heat radiation, absorbs the ultraviolet rays beyond any possibility of their proving objectionable; and at the same time transmits 27.6% of the incident light.



# DIGEST OF THE LITERATURE.

## OPHTHALMIC SOCIOLOGY AND HISTORY.

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This section deals with the literature relating to the history of ophthalmology, the professional relations of ophthalmologists, the economic applications and social bearings of ophthalmic science. It covers the literature from January, 1917, to October, 1918.

**PROPHYLAXIS.**—A paper by **Rovinsky** arrives at the following important conclusions: The early recognition of such ocular affections as keratitis and corneal ulcers in school children is so urgent that it devolves upon the state to render proper and timely aid in detecting and treating such affections whenever the parents are unable to obtain such aid themselves. The establishment of school eye clinics should be considered as a part of the system of medical school inspection, their number to conform to the needs of the surrounding neighborhood. As regards contagious eye diseases, it should be made obligatory upon the parents of public, parochial, and private school children to resort to these school clinics for diagnosis and treatment, until the children are cured and readmitted to school; unless they present sufficient evidence that their children are being treated by private physicians. Instead of resorting to private charitable agencies to procure eye glasses for children who need them; it should be the business of the clinic to supply the children with glasses either at nominal cost by arrangement with competent opticians, or free of charge.

Pamphlet number 12, issued by the National Committee for the Prevention of Blindness, on eye hazards in industrial occupations, is a valuable account of a survey of representative industries in the city of Buffalo, made by the committee in the latter part of 1915. The survey covered seventy plants, employing a total of thirty-five thousand workers. Special recommendations are made as to the precautions necessary for prevention of industrial acci-

dents among the various classes of workers. Pamphlet number 13, of the same series, "Saving Sight a Civic Duty," describes the steps taken by the city of Buffalo for the conservation of sight of its citizens. During the year 1916 the city of Buffalo did not develop a single case of blindness produced by ophthalmia neonatorum. It is suggested that an important addition to the clinical provision already made for the care of the eyes of the city's children would be some arrangement by which children who have passed the age of two years but have not yet entered the public schools could be properly looked after.

A very serviceable review of the subject of the conservation of vision, for the information of school teachers, is contained in an address by **McGuire** to a teachers' association. The address by **VanCleve** refers to an estimate that for every child allowed to go blind the state is obliged to spend from four thousand to eight thousand dollars. **Henderson**, a non-medical Indian civil servant, has written a brochure on the subject of blindness in India and the possibilities of its diminution. The reviewer of this brochure regards it as showing an extremely intimate acquaintance with the problems involved, and as presenting practical proposals for a remedy. Memorandum 15 of the Health of Munition Workers, (Brit. Jour. of Ophth., v. 1, p. 129), relates to the effect of industrial conditions upon sight.

**TRAINING OF THE BLIND.**—The outstanding feature of the literature with regard to training of the blind is discussion of the best methods to be em-

ployed in the training of the large numbers of soldiers whose sight has been destroyed. The most cheering group of contributions to the solution of this problem relate to the very successful institution established by Sir Arthur Pearson at St. Dunstan's in London, England.

An excellent account of the work accomplished at St. Dunstan's is given by **Lawson**. In addition to the London accommodations for four hundred men, four convalescent homes outside the metropolis serve a useful purpose in providing the men with trips for rebuilding their health. The condition of admission is that the patient's sight shall have been so injured that he is incapable of leading an independent existence. The great factor in the success which has attended St. Dunstan's is stated to be the youth of most of the patients. **Lawson** remarks, it is far better to go blind young than to lose sight after middle age. The men are taught to shun self pity, and are encouraged to accept their lot as an inconvenience and not as a disability. A further important point in training is the teaching of independence.

In actual training the blind men are given a working-day of four hours, two hours being given up daily to the study of Braille and typewriting, and two hours to the learning of handicrafts or trades. It is found that the intense concentration necessary in the blind, for mental visualization of everything that is learned, produces fatigue in a relatively short time. Two of the rougher trades are usually learned by each man; except in the case of a few who are especially adapted to such occupations as massage, poultry-farming, and telephoning.

In opening a discussion on the employment of the blind, **Pearson**, who is himself blind, emphasizes the importance of utilizing blind teachers for the teaching of the blind. The blind teacher is paid a salary on the regular basis. Nothing is more encouraging to the blind man than to be taken hold of and shown how to do things by one who was himself blinded only a few months earlier.

At St. Dunstan's the writing of shorthand is mastered by the blind in seven or eight months, and these blind men have shown themselves capable of doing efficiently the ordinary work of shorthand correspondence clerks. The blind man is taught not only to work but also to play; his recreational opportunities including reading and typewriting, playing games, and playing on some musical instrument, or singing. A great deal of attention is devoted to physical exercise, which includes rowing, walking, swimming, and tandem-cycling.

The third annual report of St. Dunstan's Sir Arthur Pearson contests the German estimate of two thousand blind in the spring of 1917, within the definition of blindness (V. equals 1-25th) accepted by the German War Office. At that date the English figure was about 800 and the the French 2,500.

For several reasons, including the difficulty of teaching Braille to the average man blinded in the war, **Cantonnet** has devised a raised writing in the usual characters. It is stated that those with sight can use this form of writing at the first attempt, that the intelligent blind with nimble fingers learn it in one-half hour, and that even the unintelligent can learn it within two hours. The letters, punctuation, and figures are those ordinarily employed. The writing is done with a Braille instrument, by using a special copper reglet, which has three small grooves for each letter, so that with each groove three dots can be made and with the three grooves nine points are possible. The article is illustrated.

The advantages of Braille over this method of **Cantonnet** are that the former can be used for stenography and music; and takes up somewhat less space, as there are only six points instead of nine. Each method has its own indications. One special advantage of the **Cantonnet** method is that the blind who wish to correspond with persons ignorant of blind writing can do so.

**Herz** describes a method of reproducing in a very small space and very



economically the literature of various subjects, to which the blind may not at present have access. The method proposed is one of electrical reproduction somewhat after the fashion of phonograph discs, in which however the Morse alphabet is employed. To read the reproductions a small apparatus is necessary, upon which they may be read by touch or by hearing. The books thus obtained are said to be even less voluminous than printed volumes, and the process is cheap.

The Committee on the Welfare of the Blind in England, dealt with in the *British Medical Journal* (Dec. 15, 1917) under "Care of the Blind" and "Welfare of the Blind," was instructed "to consider the present condition of the blind in the United Kingdom, and the means available for (a) their industrial or professional training, and (b) their assistance." The report recommends the establishment of a special government department to secure central control, organization, and assistance for existing voluntary agencies, and additional assistance for the blind. It is proposed that the new department shall form a part of the Ministry of Health, whenever such a ministry is created; but it is at first to be set up in the Local Government Board. The report advises that the department should be administered under the immediate guidance of an Advisory Committee of persons associated with the care of the blind.

The following uniform definition of blindness is recommended: "Blindness means too blind to perform work for which eyesight is essential." This was the definition arrived at by the Ophthalmological Section of the Royal Society of Medicine. Uniform and more effectual notification of the disease and the immediate treatment of all cases of ophthalmia neonatorum are recommended; as is also the provision and wearing of goggles in dangerous occupations on an obligatory basis. An excellent summary of the report is given in the *British Journal of Ophthalmology*, v. 2, p. 47. The committee came to the conclusion that as a general rule the earning capacity of the

blind worker could not be put higher than half that of a seeing worker. It was also found that as a rule home industries produced only one-half to two-thirds of the wages earned in workshops. The report estimates that about 3,000 places in workshops are needed for the United Kingdom, at a cost of 500 to 875 dollars each.

The report favors residential institutions rather than day centers for elementary education of young children, and also the employment of blind teachers whose salaries should be on an equality with those of sighted teachers. As regards blind children, an important recommendation is the initiation of an after-care scheme, to enable the authorities to keep in touch with each child after leaving the elementary school until some further stage in education or training is undertaken. Inspection and standardization of production should be combined with a system of coöperative buying of raw materials and selling of produce. There is an urgent need for a central free library for the blind, which would facilitate the circulation and distribution of books available.

It is interesting to note that Sir Arthur Downes, one of the members of the committee, signs a reservation calling attention to the memorial to the General Medical Council from the Ophthalmological Society of the United Kingdom in 1891, which pointed out the desirability of a more general knowledge of ophthalmology by the general medical student. Lawson comments that it is just as true today as in 1891 that the general body of the medical profession does not possess a competent knowledge of diseases of the eye. The *British Medical Journal* (August 18, 1917, page 227), refers unfavorably to the fact that altho the president of the English Local Government Board appointed a committee numbering fifteen, with a departmental official as secretary, to advise the Board on matters relating to the care and supervision of the blind, not one of the fifteen members was a medical man, so that the committee was entirely with-

out expert advice from the medical point of view.

**Bordley**, at a conference on the re-education of the war-blinded, from the point of view of a member of the staff of the Surgeon General of the United States, outlines the provision made so far for the care of blinded American soldiers. He regards the attitude of the blind as one not of happiness but rather of resignation. The education of the blind from the American army and navy is to be undertaken in a military training school for the blind which is located on a magnificent estate in Baltimore. When the blind have completed their courses in that school, trial employment will be given them. The American Red Cross has authorized the organization of the Red Cross Institute for the blind, which will supply the necessary economic and social supervision for soldiers, sailors, and marines from the time of their discharge from the army or navy until they die.

In France, the service as regards blind men from the United States army begins at the base hospital. Here no serious attempt is made to teach the man how to help himself to make a living, but he is shown how to amuse himself. From the base hospital he goes to the special hospital center which has been designated as the point of concentration for the blind. Here he will be taught to read and write and play games; to shave and dress himself, to walk with a cane, to write his own letters, and to read books for the blind. If on arriving in this country his injuries are found to be permanent, he will be taught in the blind institute, where he will ultimately get training in professional work, commercial work, the trades or agriculture.

**Loeb** urges the immediate starting, for the United States as a whole, of one central institution for the care of the blind from the fighting forces; preferably in some large city, with adequate equipment and facilities for the disposal of articles manufactured; with further provision for the aid of such soldiers in their own or other homes.

The paper by **Wright** describes the

vocational work carried on for the blind in Massachusetts, by the State Commission. The papers on the Chicago Lighthouse for the Blind are written by two pupils, **Austin** and **Williams**. An account of the vocational instruction given the blind by the state of Illinois is written by **Comstock**.

Several papers or addresses by German writers on the care and training of the blind cover much the same general ground as do the papers in English already referred to. **Silberstern** emphasizes the importance of a universal understanding of the fact that the blind person can be returned to a life of cheerful productive activity; and further that his systematic training is necessary. **Krückmann** demands that the blind shall as far as possible be returned to their own occupations, or to occupations as closely allied as possible with those in which they were engaged in the seeing period. They should if possible not be separated from seeing persons.

Calling attention to the need for ophthalmologic knowledge among army surgeons, **Elschnig** strongly recommends, in addition to a general improvement in the ophthalmologic training of medical students, a period of three months training in an eye clinic for every active military surgeon, an increase in the number of ophthalmologic specialists, and the establishment of eye stations in all the larger civil and military infirmaries.

The British Journal of Ophthalmology (v. 2, p. 48) describes the library facilities available in the British Isles for the use of the blind. The principal one is the National Library for the Blind in London, which contains approximately forty thousand volumes, representing between seven and eight thousand separate works. Other important libraries are scattered over the United Kingdom. "The re-education and future of the war blind" is the subject of a discussion in the Ophthalmological Society of Paris. The subject of state legislation concerning the blind is very completely reviewed by **Allport**, whose paper reproduces the pamphlet by **Lewis** upon, "What to do



for blind children," published by the American Medical Association, lists the state institutions for the blind in the United States, and gives the laws on the subject in the different states. **Swinerton's** paper relates to the treatment of some of the postural defects and habit motions of the blind.

**VISUAL REQUIREMENTS FOR VARIOUS PURPOSES.**—Under the auspices of the Ophthalmological Society of the United Kingdom and of the Section of Ophthalmology of the Royal Society of Medicine (England), steps have been taken for the formation of a council of British Ophthalmologists for the purpose of advising and assisting government departments and other public bodies as to suitable standards of vision for different occupations, as to measures for the preservation and welfare of the eyesight of the community, and in any other matters in which the knowledge and experience of ophthalmologists might be of special service. (*Brit. Jour. of Ophth.* v. 2, p. 47.)

The amended selective service regulations of the United States army provide for the acceptance of all registrants with vision of 20-100ths in one eye and 20-40ths in the other, without glasses; or 20-100ths in each eye without glasses if correctable with glasses to 20-40ths in either eye. Color-blindness is not a cause for rejection, nor is strabismus if the vision is up to standard. **Wilder** emphasizes the necessity that the local examiner should properly arrange the light source in relation to the test card. As a means of escaping trickery, he advises that the test card should be cut across and the parts pasted together with a cloth hinge, hanging the card up so that the first line visible is 20-100ths. **Wilder** also urges that in the present great crisis, the standards of visual requirements for the United States army, at least in certain branches of the service, should be made more elastic; in order that men may not be lost to the service who, apart from their eyes, are in good condition for such service.

**Chance's** paper on the ophthalmic examination of drafted men at Camp Jackson contains a series of statistics

as to the ocular causes for rejection of recruits. The discussion of this paper by **Hansell** was in part to the effect that although the advisory boards were requested to assign men for selective service, yet the limitation as to vision being at least 20-100ths and 20-40ths involved the loss of many men who were eligible for this purpose. **Posey** however felt that a soldier could not possess safely less than 20-100ths vision in each eye, for with a lesser degree of visual acuity it would be impossible for him to escape accident in many situations to which he might be exposed.

A total number of 2,640 cases of defective vision seen at an English ophthalmic center between June and November, 1915, is classified by **Harford**. All the men examined had been previously rejected for military service as being below standard, or on account of certain obvious defects. The most important question was found to be that of myopia. Nearly one-third of the total of cases of defective vision were of myopia which was capable of being corrected by glasses so as to fit the men to shoot.

The Committee of the Ophthalmological Society of Great Britain as to the standards of vision desirable for the British army recommends: That the strength of the correcting lens which a man may wear should not exceed 8. D., spheric, or 4. D. cylindric and 8. D. for the highest meridian of sphero-cylindricals. For men who are to be trained to shoot with the rifle and to serve in the field, the vision recommended is 6-24ths with either right or left eye without glasses; and at least 6-12ths with the right eye aided if necessary by glasses.

For garrison duty at home or abroad the vision recommended is 6-60ths, with either right or left eye without glasses, and at least 6-18ths with the right eye, aided if necessary by glasses; and the strength of the correcting lenses is put respectively at not exceeding 10, 6 and 10 D. respectively. For those who are not to receive military training, but to be employed only in auxiliary services, minimum vision

of at least 6-60ths with one eye, either right or left, with or without glasses, is recommended; and a limitation of the correcting lens to respective strengths of 15, 6 and 15 D. The British Journal of Ophthalmology, v. 2, p. 229, suggests that any man, otherwise physically fit, whose vision is such that he can earn a living in civil life, is capable of efficient service in some military capacity.

**Angelucci**, writing with regard to the Italian army, recommends the adoption for the correction of defects of vision not merely negative spherical lenses but also positive sphere and cylindric lenses. He would also place the minimum visual acuity of one eye at  $1/4$ , and would allow correction of high myopic and astigmatic errors. He would also provide for military instruction of trachoma patients in special quarters. **Trombetta**, however, objects to the proposal to lower the standards of visual acuity for soldiers.

**Elschnig** states that in spite of the great number of myopes in the German army, very few traumatic detachments of the retina have been observed, and also very few injuries from spectacle glass. **Greeff** refers to the use in the German army of zellon, a derivative of cellulose, analogous to celluloid but unflammable and not attacked by acids or strong gases. In thin layers this substance is employed for spectacles protective against sand, wind, and also for masks. A triple glass is also employed, (see p. 239). When the triple glass is broken the fragments have less projectile force and are less pointed.

**Greenwood** outlines the optical equipment (workshop and lenses) which with his cooperation has been established for the United States army in France. The plan was to establish in some central location a plant capable of turning out one hundred and fifty to two hundred pairs of lenses a day, and also to take care of all repair work that might come in. He suggests that a total of sixty-three types of lenses, forty-five cylindrical and spherocylindrical, ten concave spherical, and eight convexspherical, pro-

vides a sufficient equipment for the use of the army; the cylindrical lenses being of course circular to allow for variation in axis. The relation of aphakia to military service is discussed by **Santos Fernandez**, who describes a case in which full visual acuity was obtained with a cataract lens, the other eye being blind; and in which in his opinion the patient, a youth of sixteen years, was adapted to military service. **Kyle's** paper is a brief explanation of various eye conditions for the use of base hospital surgeons.

The Surgeon General, U. S. A. (Jour. A. M. A., v. 69, p. 917), has authorized the formation of units devoted to the surgery of the head, for the purpose of coordinating the work of the brain, eye, ear, nose and throat, and mouth surgeons. **De Lapersonne** prepared for submission to the undersecretary of state of the French health service a report on various military aspects of ophthalmology, especially the organization of ophthalmologic service in the army.

The paper by **Weekers**, of the Belgian army, also relates to the organization of ophthalmologic service in the army. It contains the classification of one thousand consecutive eye cases in the army service. For astigmatic cases the Belgian army makes use of a solid mounting with large round lenses. **Cirincione's** observations on the necessity for modifying the ophthalmologic service in the army relate especially to certain conditions of eye hospital service in the Italian army, which the author considers are capable of improvement. **Smith** describes the work of the eye, ear, nose and throat surgeon at the recruiting depot. **Wallace** writes on the conditions affecting the standards of vision in the army, and **Cruise** on protection of the eye in warfare.

The ocular requirements for aviators are summarized by **Small** as follows: Uncorrected vision of 20-20ths in each eye; binocular vision; absence of nystagmus; normal muscle balance and competent ocular muscles; normal pupillary reaction and no pupil irregularities when dilated; normal media and fundi; normal visual fields, by perimet-



ric examination; and normal color sense. **Anderson**, of the British army, strongly emphasizes the necessity that the aviator should have unaided normal vision in both eyes and in each eye separately, and also normal color vision; and gives examples from his own experience of fatalities having occurred which were almost certainly due to defects of vision. Candidates should be examined for latent hyperopia; which has in some instances been found to be responsible for bad landings. **Anderson** admits, however, that some pupils, who have had a long experience as aerial observers, learn to fly well in spite of imperfect vision.

**Carson** discussed the visual requirements of the United States navy. Astigmatism greater than 0.75 diopter is likely to interfere with ability to see in sharp focus both of the intersecting lines in the telescopic sights of the large guns. A marked amount of hyperopia is undesirable in a gun pointer, since in the stress of practice or in actual battle the vision may become blurred from relaxation of the accommodation. **Trible**, dealing with ophthalmology as a specialty ashore and afloat, states that as yet it has not been feasible to have an eye specialist do only eye work, but that one man must be able to take care of eye, ear, nose and throat.

An editorial in the *British Medical Journal*, Sept. 15, 1917, p. 367, on eyesight and hearing certificates for firemen in mines refers to a communication by the English home secretary with regard to a provision that a person holding the certificate of qualification as a fireman, examiner, or deputy must subsequently, so long as he continues to be employed, obtain every five years from a school, institution, or authority approved by the secretary of state, or from a medical practitioner, a fresh certificate in the prescribed form, to the effect that his eyesight enables him to make accurate tests for inflammable gas, and that his hearing enables him to carry out his duties efficiently.

**INDUSTRIAL INJURIES AND COMPENSATION.**—The basis of compensation for injuries to the eye is discussed by

**Gradle**. It is recommended that at least two months should elapse, between the time when the last trace of visible inflammation disappeared from the eye involved, before the final estimation of disability is attempted. The variable factors which are to be considered include: (1) The vision of the injured eye, which should be computed in tenths, referring to the best possible vision obtainable with or without correcting glasses; provided that the strength of spherical lens required shall be not more than four diopters different from the spherical lens required to obtain the best possible vision in the other eye. (2) The vision of the uninjured eye, to be computed upon a similar basis. (3) The ability to recognize depth at arm's length or less; and (4) the cosmetic result, since the effect of a disfiguring injury upon the individual cannot be neglected.

These four factors are to be given respective total values of 100, 100, 100, and 50, making a total possible rating of 350. The total of the percentage estimated for the various factors is to be divided by 3.5 to arrive at the estimation of ocular efficiency; the money result being obtained by taking the resulting percentage of fifty-two weeks' wages, which the laws of the majority of states have adopted as the compensation for the total loss of an eyeball. When both eyes are impaired, the total compensation, percentages of which are to be calculated, should be three times that estimated for one eye alone. In cases of direct injury to one eye alone, where the other eye becomes involved by the development of sympathetic ophthalmia, at least twelve and not more than 16 months should elapse before the compensation is determined.

In cases of direct injury to one eye where the other eye is absent, or has vision of 1-10th, or less, the compensation is to be governed by one factor only, namely the ultimate vision. Estimations are also given for injuries outside the eyeball, injury to any part of the head outside the eye resulting in disturbance of the visual field of one eye alone; and injury to any part of the head outside the eye resulting in dis-

turbance of the visual fields of both eyes.

The subject of ocular accidents of industry is considered by **Schleisinger**, who tabulates some of the percentages of compensation allowed by French tribunals; and refers to the Argentine law of 1915, according to which blindness of one eye is to be compensated for on a 42 per cent basis, and loss of both eyes is to be figured as absolute incapacity. **Chapman's** paper as to the determination of indemnities following injuries to the eyes summarizes the provisions of the various states, more especially as to the loss of one eye.

The supreme court of Michigan (Jour. A. M. A., v. 68, p. 2005), affirmed an award by the industrial accident board in favor of a claim as for the loss of an eye; altho the eye had been previously injured leaving just enough vision in it to distinguish daylight from dark, or to tell an approaching object. The legislature of Michigan had apparently not specified a normal eye, but merely referred to the loss of an eye. A decision by the supreme court of New York (Jour. A. M. A., v. 71, pp. 309, 490), held that the loss of the lens of an eye was not the loss of an eye within the contemplation of the workmen's compensation law; since thru the use of an artificial lens the eye, so far as its use alone was concerned, could fulfil the natural function of an eye.

The functional loss from aphakia in the war injured is estimated by **Teulières** upon the basis of the following percentages, which are to be added to the indemnity figure obtained in the ordinary way by means of the visual acuity. (1) One eye not operated upon and having useful vision, the other eye aphakic and obtaining useful vision after correction, 10 per cent. (2) One eye not operated upon and having vision which cannot be utilized, the other aphakic, and having useful vision after correction, 5 per cent. (3) One eye aphakic and not having useful vision after correction, 5 per cent. (4) Both eyes aphakic and having useful vision after correction, 15 per cent.

The Court of Appeals of Kentucky

(J. A. M. A., v. 71, p. 306), held that the loss of sight of an eye from an embolus, which affected the eye upon exertion in the course of the claimant's employment, was not caused by accidental means within the terms of a policy of insurance against bodily injury sustained thru accidental means. **Coulter** describes a case in which an English county court awarded compensation on the basis of a keratitis developed in the second eye subsequently to a keratitis in the first eye which was apparently secondary to an industrial injury.

**Snell** proposes that the questionnaire in cases insured under the workmen's compensation law shall call for information as follows: Central visual acuity of each eye, uncorrected, corrected, expressed in a decimal; field of vision for each eye in decimal; condition of visual muscles, extraocular, intraocular; condition as to binocular or stereoscopic vision; summary of the case, including diagnosis, ophthalmoscopic examination, percentage of useful vision, and prognosis; and to what extent the physician's estimation of useful vision differs from the scientific measure of vision.

**Murray** gives details of, and tabulates, 102 cases of ocular injury and disturbances, encountered among the twenty-three thousand miners of the Lackawanna Coal Company in Pennsylvania. Attention is especially called to the fact that those who reported promptly had an average disability of six and one-half days, whereas out of eighteen patients who did not apply for treatment until from five to ten days after injury, thirteen, with an average disability of thirty-one days, had foul ulcers of the eyes. Certain defects in the application of the law are mentioned.

A chapter of **Beauvieux's** thesis, on visual troubles in injuries by firearms to the visual cortex or the optic radiations, is devoted to an evaluation of the invalidity produced by traumatic hemianopias. While admitting the complexity of the problem, Beauvieux refers to the following as calling for consideration in arriving at a result: (1) the



form of the hemianopia (right or left, quadrant, scotoma, concentric, retraction, etc.); and (2) the participation of the central visual acuity in the perimetric defects.

**Lapersonne** is quoted with approval as indicating that the evaluation of a sector of incapacity should be superior to the incapacity produced by the total loss of an eye. The estimate should be delayed, on account of the frequent occurrence of changes in the extent and shape of traumatic hemianopias during the months following the injury; and **Coutela** is quoted with approval as recommending a maximum of five years for a final decision. It must, moreover, not be forgotten that all these injured soldiers show general cerebral symptoms, and that it is necessary to bear in mind the concomitant nervous disturbances.

**OPHTHALMIC EDUCATION.** — **Jackson** calls attention to the fact that most clinical students of ophthalmology lack the preparatory training which would enable them to profit by their clinical studies. The systematic courses of graduate teaching in ophthalmology, where instruction is given in ocular anatomy, pathology, and optics, are taken by only a minority of those who are preparing for ophthalmic practice. Even an internship in an ophthalmic hospital is largely thrown away on a medical graduate who is ignorant of ocular anatomy and pathology and of physiologic optics. Plane trigonometry is essential to an intelligent study of optics, but is nowhere a preliminary to the study of medicine.

In the department of clinical work the most important portions are diagnosis and the exact estimation of errors of refraction. In the examination of the American Board for Ophthalmic Examinations even men of rather large clinical experience were lacking in regard to the recognition of intraocular conditions and the exact estimation of refractive errors. The worst defects in the present training for ophthalmic practice would be met, if each university that has a medical department would establish short courses in physiologic optics, ocular anatomy, and ocu-

lar pathology, and would bring these to the notice of every medical student, as courses to be taken before seeking clinical training for ophthalmic practice.

The ophthalmic examinations conducted by the American Board for Ophthalmic Examinations now serve as the examinations of the ophthalmic candidates for fellowship in the American College of Surgeons. **Rochon-Duvigneaud** urges that the reconstruction of France after the war shall include reform in the teaching of ophthalmology. One step toward this will be the payment of such salaries to professors of ophthalmology (and incidentally to other teachers of medicine) that they may be able to devote their whole time to teaching work; without sacrificing the situation in their profession to which they are entitled and which can only be maintained on an adequate financial basis. He complains that physiologic optics is not taught, except in an entirely theoretic fashion; and that ocular physiology and special anatomy are not taught.

An editorial comment in the *British Journal of Ophthalmology*, v. 2, p. 147, calls attention to the curious anomaly by which, altho ophthalmic surgeons in England look upon the diploma of the Royal College of Surgeons as essential for appointment to the staffs of ophthalmic hospitals in London, there are no ophthalmic surgeons on the boards of either the membership or fellowship examinations of the Royal College; and the Boards do not often ask ophthalmic questions in their examinations. It was suggested that some body such as the Royal College of Surgeons or the London University, should institute an examination for a scholarship or mastership of Surgery in ophthalmology, rather than allow a number of subsidiary examinations to spring up. The Tennent Chair of Ophthalmology at Glasgow, Scotland (*Brit. J. Ophth.*, v. 1, p. 553), has been established out of a fund of twenty-five thousand pounds left by Dr. Gavin P. Tennent, who died in 1913. The salary attached to the professorship is to be five hundred pounds per annum, and the professor is not to be required, him-

self, to give instruction to undergraduate students, but is to apply himself to the promotion of higher studies in ophthalmology and to research.

Guthrie, of Louisiana State University, argues that the ideal course in optics should be based from first to last upon the electromagnetic theory of light, which he complains is at present entirely ignored in the text books and in the usual teaching of the subject. The ordnance department of the United States army has established (*Science*, v. 48, p. 109), a training school for operatives on precision optics. The establishment of this training school was rendered necessary by the fact that there was not an adequate supply of skilled labor for the manufacture of the lenses and prisms required for optical purposes by the army and navy, or for the assembly of these lenses and prisms into finished instruments. An institute of applied optics is the subject of a scheme which is said to be on foot in Paris, France; it being hoped that the institute may be grouped into three sections, a college of optics, a central optical laboratory, and a special trade school dealing with the practical branches of the trade.

**OPTOMETRY.**—State legislation concerning optometry is exhaustively covered by Allport, in a paper which further reproduces the complete text of the optometry laws of the various states. Generally, these laws provide that it shall be unlawful to practice optometry without a properly obtained certificate or license; the definition of the practice of optometry being the possession at the place of business of any of the mechanical means for fitting glasses, or the displaying of a sign, notice, or advertisement implying that the eyes are refracted or fitted with glasses.

In Colorado an itinerant license can be obtained by paying an additional fee. The optometrist must not give out the impression of being in any sense a practitioner of medicine, and must not call himself a doctor of medicine or even a doctor of optometry or a doctor of any kind, or an eye special-

ist, or anything of this nature calculated to deceive or mislead the public. In Maryland optometrists are not allowed to sell concave glasses to children under fifteen years of age, nor can they sell glasses to people who have diseased eyes, except with the knowledge and consent of a physician.

In South Dakota the registered optometrists constitute a legal society; which meets once a year, transacts business, and recommends board members to the governor, who selects the members from this submitted list. The secretary of the board is also the secretary of the society and receives a salary fixed by the society, and his expenses. The requirements for examinations and license vary greatly in different states.

The British Journal of Ophthalmology (v. 2, p. 435), summarizes the recommendations of Mr. Justice Hodgins, who was commissioned to inquire, among other details of medical education, into the status and practice of opticians or optometrists in Ontario. In that province there are said to be only sixty-five men who specialize in ophthalmology, while there are nine hundred who practice optometry. The commissioner remarks that in a medical education there is no sufficient specific instruction in this branch; and he comments upon the circumstance that few medical men are able to do refraction with accuracy.

He does not see any reason why optometry should not acquire a definite status "if it is willing to do so at the cost of such liberal education as will fit its practitioners for their work." He would add to the course in physics and optics, which he believes should be required for those practicing optometry, sufficient instruction in medicine to enable abnormal conditions to be distinguished, and proposes that the course for optometrists shall be of two years' duration. The final recommendation is that all who practice optometry shall be required to pass the suggested examination within six months.

The Pennsylvania optometry bill was finally passed; and was signed by the governor, who vetoed a bill of sim-



ilar purpose a year previously. He expressed the hope that in the next session of the Assembly the qualifications for admission to the study of optometry may be placed upon a higher educational basis. The optometry act of Illinois has been declared unconstitutional by the Supreme Court of Illinois. The judgment was given upon a case against a man who had tested the eyes of a patient with glasses and had collected a fee, without having a license to practice optometry. The court held that the exemptions in the act, relating to those who have practiced for three years, regardless of character, habits, skill, or knowledge of optometry, showed the act to be unreasonable; and that as no particular standard of skill was required and no examination prescribed, the fitting of glasses under the act did not differ materially from the fitting of shoes by a shoemaker, and that no more reason existed for licensing one than the other.

The decision of the court is said to be in line with its rulings in later years to the effect that the practice of new and special professions will not be permanent unless a general standard is fixed to which applicants must conform, thus creating a valid branch of scientific learning not only in name but in fact. In California, on the other hand, an optometrist who called herself an ophthalmologist failed to obtain an injunction from the supreme court of the United States, to restrain the enforcement of the California law regulating the practice of optometry, which provides that it shall not be construed to prevent duly licensed physicians and surgeons from treating the human eye.

Reeve discusses the optometry movement as seen in Canada, where the opticians, at least as regards the Province of Ontario, aim to secure incorporation as optometrists; and virtually as a profession with powers as to education, examination, licensing and discipline akin to those of the College of Physicians and Surgeons. The provisions of the Ohio optometry bill, with arguments against its adoption, are given in the *Ohio State Medical Journal*, 1917, p. 94.

**NOMENCLATURE.**—**Dunn** quarrels with the use of a number of expressions current in ophthalmologic phraseology. The paper is entitled "Ophthalmic Terminology; Its Solecisms and Antiquitation," and it may not be amiss to suggest that the word "antiquitation" is itself inaccurate, as the word properly to be used in this relation is "antiquation." The expressions to which he objects include "bulbus oculi," which he feels is redundant inasmuch as the ball is the whole eye. There is, however, in English usage a distinction between the eyeball and the appendages of the eye. "Ophthalmia neonatorum" he regards as unscientific, "lenticular" he feels should be replaced by "lental," "sclerotic" by "sclera" when used as a noun, and "phthisis bulbi" by "atrophy of the eyeball." The expression "sympathetic ophthalmia" he regards as suggesting that sympathy is a cause for inflammation.

**CLINICAL INSTITUTIONS AND STATISTICS.**—The question of how the eye and ear service in general hospitals can be improved, is answered by **Allport** with demands for the provision of special quarters, special nurses, special interns, and special equipment for these classes of cases in the general hospitals. A brief description of a professional visit to New York City is given by **Santos Fernandez**, who mentions some of the clinical facilities available, and summarizes some statistics of the Episcopal Hospital.

An account of the New York Children's Eye Clinics is given by **Carhart**. When he wrote there were nine children's eye clinics in New York City maintained by the bureau of child hygiene of the municipal department of health. In those clinics all school children of any of the public or parochial schools were treated for eye diseases or fitted with proper glasses by a staff of competent specialists taken from the eligible lists of the municipal civil service.

Twenty-eight additional clinics for treating contagious eye diseases in the schools had then been asked for. At some of the clinics as many as one

hundred and fifty to two hundred children were treated for sore eyes in one day, during the rush season. It having been found that the virulence of the contagion of trachoma is largely removed by treatment of the disease along approved lines, many of the trachoma cases are no longer excluded from school, if the children are faithful in attendance at the clinic; altho trachoma schools have been started where children afflicted with contagious trachoma can be isolated from other children and yet continue at their studies in special classes suited to their needs. **Brannick** discusses the possibilities of social service work in an eye hospital or dispensary. The Knapp Eye Hospital in New York City is described by **Arnold Knapp**, the son of its founder.

The report on the blind in the United States, based upon the 1910 census, indicates that 30.8 per cent, or somewhat less than one-third of the blind population, lost their sight when less than twenty years of age, including those born blind; 47.4 per cent, or somewhat less than one-half, from twenty to fifty-four years; and 21.8 per cent, or a little over one-fifth, after passing their sixty-fifth year.

More persons had lost their sight when less than five years of age, than in any other five year period of life, 16.4 per cent of the total being included in this group. Persons reported as being born blind formed 6.6 per cent of the total, while 5 per cent had lost their sight when less than one year old, these two groups together contributing 11.6 per cent, of those reporting the age when vision was lost. The thirty thousand blind represented in the returns had, on an average, been blind for sixteen years.

In 1880 persons who became blind before completing their first year of life formed 15.3 per cent of the total reporting as compared with only 11.6 per cent in 1910. The majority of those who have not married before they lose their sight continue single for the rest of their lives. **Genet** estimates the number of men in France between the ages of twenty-three and forty-two

years who have had one eye enucleated as being close to one per thousand.

Statistics as to the occurrence of ocular defects and diseases at the Massachusetts State Reformatory for women at Sherborn are given by **Jessaman**. Statistics, together with an account of the clinical aspects, of ophthalmic practice in Cairo and Alexandria, Egypt, are given by **Eason**; who states that among the troops there is little serious disease, and a good deal of malingering and exaggerated functional disease. **Gibson** writes a report on the ophthalmic department at Lemnos in the British military service.

Notes on the functioning of an ophthalmologic service in the French ambulances at the front are written by **Lacroix**. He found the greater part of the ambulance work to be of a minor nature, such as refitting soldiers who had lost their glasses, removing small foreign bodies, and opening chalazia. Nearly ten per cent, however, of the total number of wounded were eye patients. Some comparative figures as to blindness in Portugal and in other countries of Europe are given by **Santos**. **MacCallan** summarizes the statistics of blindness in Egypt during 1914; and statistics of the Government Ophthalmic Hospital at Madras, India, are given in the annual report of the hospital for the year 1916.

**HISTORY.**—The "British Masters of Ophthalmology Series" in the British Journal of Ophthalmology includes biographic essays, of thoro and attractive literary workmanship, and accompanied in most instances by excellent portrait reproductions. The series is opened by **Fergus** with a sketch of the life of William McKenzie, whose name is known to ophthalmologists as the author of a "Practical Treatise on the Diseases of the Eye," which first appeared in 1830 and ran thru many editions, the last published in 1854.

The three papers by **Dunn** deal with: (1) Benjamin Travers, one of the first general surgeons in England to combine with his work the study of eye diseases; and who succeeded Saunders, the founder of the London Infirmary for Diseases of the Eye, as surgeon to



that institution, which has later been widely known as Moorfields Eye Hospital. (2) James Ware, resuscitator of the suggestion of Pott in favor of the operation of needling, and the first ophthalmic surgeon in England to use extract of belladonna in the preparation of his needling cases. (3) Sir William Adams, a pupil and assistant of Saunders, and the first ophthalmic surgeon to be honored by distinction as oculist to the English royal family. An account of Sir William Robert Wills Wilde (father of Oscar Wilde), a prolific writer on medical and other topics, and who took the first steps in teaching ophthalmic surgery to medical students in Dublin, Ireland, is given by **Story**. **Sym** writes concerning James Wardrop, a pupil of Beer of Vienna at the beginning of the nineteenth century, and surgeon-in-ordinary to King George IV.

**Risley's** history of the rise and progress of ophthalmology as a specialty in Philadelphia gives an account of the Pennsylvania Infirmary for Diseases of the Eye and Ear, founded in 1822; of the activities of a number of famous Philadelphia ophthalmologists; of the recognition of ophthalmology as a specialty about 1870, and of the organization in that year of the Ophthalmological Society of Philadelphia; and of the creation in 1893 of the Section on Ophthalmology of the College of Physicians of Philadelphia. The early history of ophthalmology in Chicago, as related by **Wood**, refers to Holmes, founder of the Chicago Charitable Eye and Ear Infirmary, later the Illinois Charitable Eye and Ear Infirmary; and to a number of other eminent early Chicago ophthalmologists, most of whom were general surgeons who devoted special attention to the eye.

The material for the history of ophthalmology in the Argentine Republic, elaborately presented by **Argañaraz**, includes a sketch of the development of medical education in Argentina, the status of ophthalmology before the establishment of a special chair in ophthalmology in 1875; the establishment of that chair, a series of eminent ophthalmologists who have occupied it, es-

pecially including **Lagleyze**; a consideration of blindness in the Argentine Republic, the various ophthalmological services in the country, the ophthalmologic society of Buenos Aires, and an ophthalmologic bibliography of Argentine writers on the subject. **Hansell** writes a tribute to Professor **Stanculeanu**, who left Bucharest at the time of the Rumanian collapse, and who died in the United States after a complete mental breakdown.

The establishment of the new **AMERICAN JOURNAL OF OPHTHALMOLOGY** gives occasion for a series of brief accounts of the careers of the various publications which the new journal supplants. An account of the former *American Journal of Ophthalmology* is given by **Alt**, of the *Annals of Ophthalmology* by **Loeb**, of the *Ophthalmic Record* by **Savage** and again by **Brawley**, of *Ophthalmology* by **Würdemann**, and of the *Ophthalmic Year Book and Ophthalmic Literature* by **Jackson**. In a similar connection (v 20, p. 333) is given a valedictory autobiography of the Royal London Ophthalmic Hospital Reports, one of the publications which yielded place to the *British Journal of Ophthalmology*.

An excellent summary in English of the events leading to the invention of the ophthalmoscope is given by **McMullen**. The instrument described in 1851 in **Helmholtz's** monograph consisted essentially of a transparent reflector, composed of three thin plane parallel plates of glass, set at an angle to reflect the greatest possible amount of light into the eye; while on the observer's side of the mirror was a holder for a concave lens to enable the fundus details of the patient's eye to be seen clearly. "Like many other important inventions and discoveries, that of the ophthalmoscope was the result of the completion and coordination, by an exceptionally gifted individual, of the work of many previous investigators."

**Shastid's** history of ophthalmology covers 380 pages of volume eleven of the *American Encyclopedia of Ophthalmology*. **Elliot's** paper on eccentricities of Indian ophthalmic practice

is principally a study of Hindu superstitions in relation to the practice of ophthalmology. **Taylor** gives an account of "A Briefe Treatise on the Preservation of Eie-sight," first printed in the reign of Queen Elizabeth of England, from the pen of Walter Bailey (1529-1592).

**Hirschberg's** historical remarks on cataract extraction relate to **Silvester O'Halloran's** "Method of Cataract Extraction," published in 1788, and to two Italian monographs on cataract extraction by **Santerelli**, of 1795 and 1805. **Crisp's** review of the history of the op-

eration for cataract summarizes the available records as to the operation of couching as practiced in remote antiquity, and in recent times among the inhabitants of India; and as to the circumstances under which the modern cataract operation was discovered and popularized. A translation is given of a description of the extraction operation by **Johann Gottlieb Schäffer**, from a small work published by that writer in 1765 under the title "*Geschichte des grauen Staares, und der neuen Operation Solchen durch Herausnehmung der Crystalline zu heylen.*"



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This includes all papers referred to in the Digest of the Literature. It is arranged alphabetically according to the authors' names. (Bibl.) indicates that the paper is accompanied by an important bibliography. (Dis.) indicates that the paper has been read before some society, and that the discussion elicited is published with it. (Ill.) with number in brackets indicates the number of illustrations printed with the text. (Pl.) with number gives the number of plates accompanying the article.

All titles are in English and many of them are considerably abbreviated. Where a paper has been published in some other language, and a translation, or a good abstract in English, French, or German, the second reference given is to such abstract. The number in small **heavy face** type at the end of each reference indicates the page in this volume on which the paper is referred to.

To find all the papers referring to a single subject, turn to the account of that subject in the digest of the literature, where the authors' names are given in **heavy face** type. From the author's name the paper, or papers he has written, and the places of their publication, are readily found from the following list:

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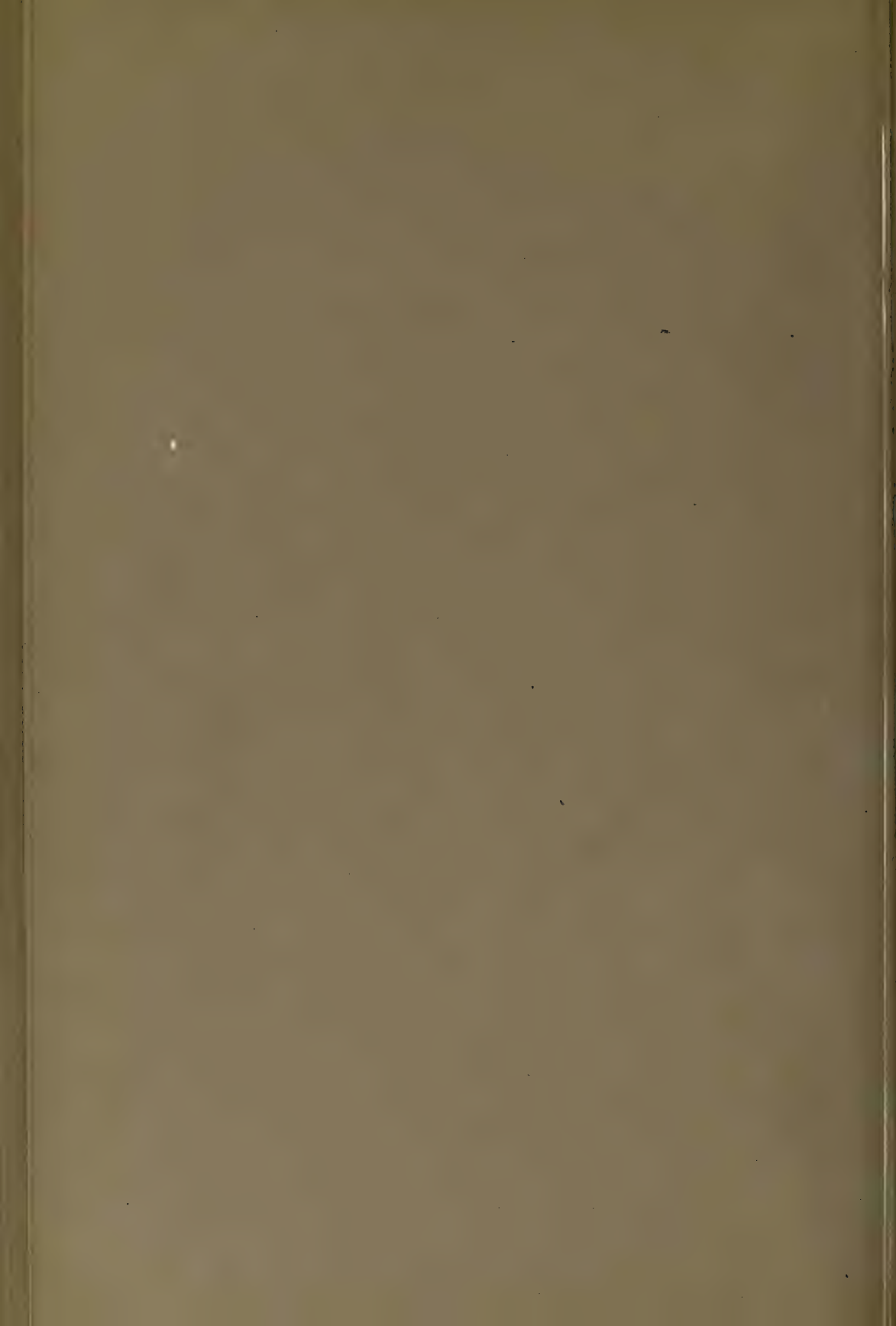


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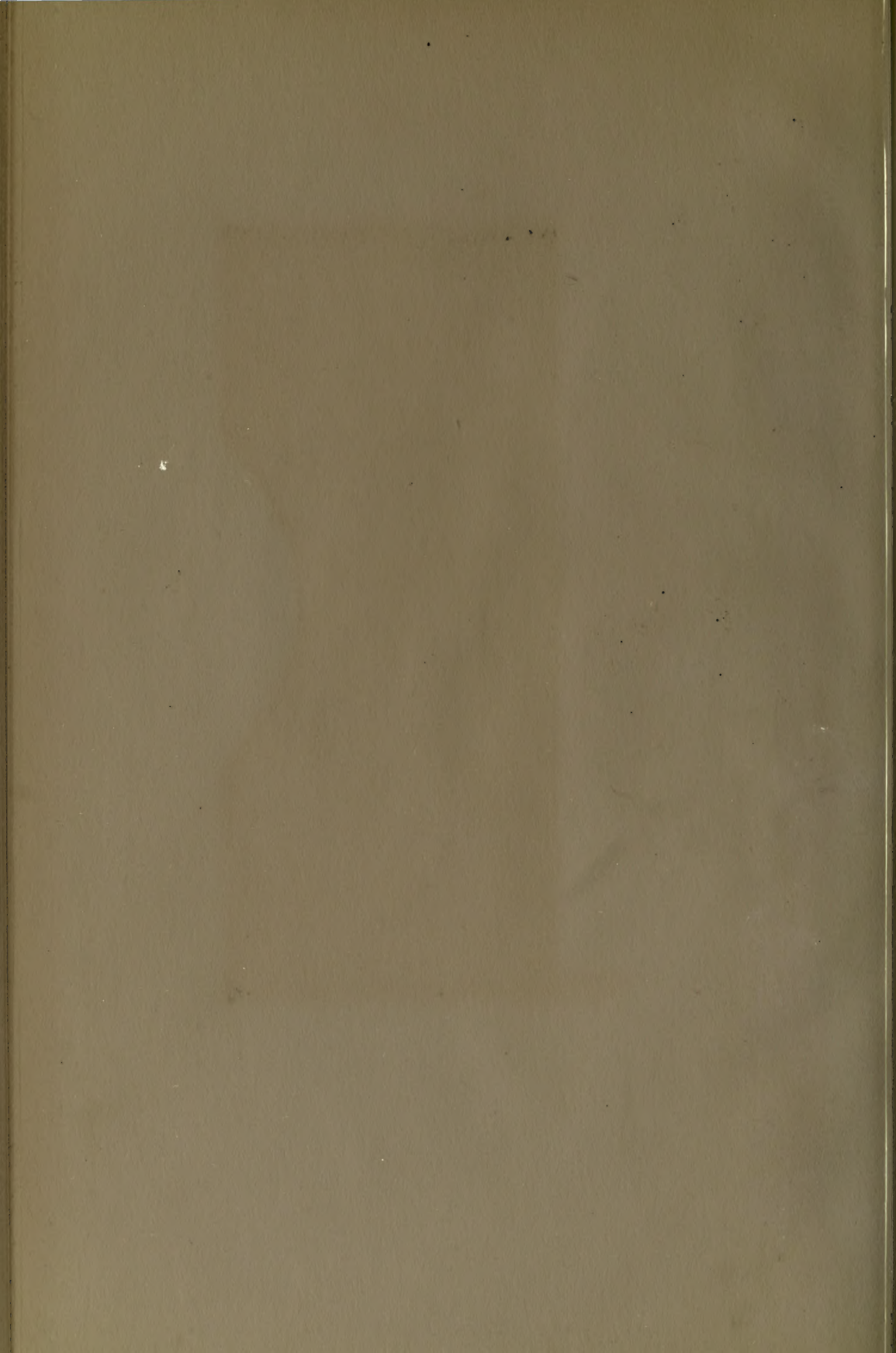


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